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Hollywood Holocaust

Life in Space
A Guide for Colonists

FUTURE

LIFE

DECEMBER 1979

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Dec. 1979 #15

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Business and Editorial Offices:

FUTURE LIFE Magazine
475 Park Avenue South
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Publishers

NORMAN JACOBS
KERRY O'QUINN

Editors

ED NAHA
ROBIN SNELSON

Managing Editor

BARBARA KRASNOFF

Art Director

CHEH NAM LOW

Assoc. Art Director

ELAINE ASHBURN-SILVER

Asst. Art Director

BOB SEFCIK

Art Assistant

LAURA O'BRIEN

Columnists

CAROLYN HENSON
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Contributing Editors

DAVID HUTCHISON
HOWARD ZIMMERMAN

Space Art Advisor

RON MILLER

West Coast Editor

DAVID HOUSTON

Special Projects

TOM O'STEEN

Guest Columnist

HARRY HARRISON

Associate Publisher

IRA FRIEDMAN

Assistant Publisher

RITA EISENSTEIN

Production Assistants: Beverly Gerdin-Campbell, David Hirsch, Peter Mosen, Susanne Oster, Angelique Trouvere.

Contributors This Issue: Charles Bogle, Jill Bauman, Hank Caruso, Leonard David, Don Davis, Don Dixon, David Egge, Michael Esteban, Pat Glossup, Rick Guidice, Philip Harrison, T.A. Heppenheimer, Bob Heyman, Hillary, James Holahan, Joseph Kay, Duke Lee, Nancy Naglin, Lem Pitkin, Barclay Shaw, Les Space, Adam Star-child, Denise Watt-Geiger, Kit Weinrichter, Karen Willson.

For Advertising Information: Ira Friedman, Rita Eisenstein: (212) 689-2830.

ON THE COVER: This futuristic, rotorized blimp was conceived by Goodyear and painted by David Egge. For more about the airship in your future, see page 38.

ON THE CONTENTS PAGE: A photomicrograph of a glass edge taken under an interference microscope. More microscopic spacescapes by Duke Lee can be found on page 58.

output

Miracle Workers

Recently, I attended a magazine sales conference in the California desert. As my flight descended toward the airstrip I looked down on jagged mountains baked dry by the constant fierce sun. The crevices and gullies between rocky ridges were filled with sand, flowing downward like petrified rivers—reaching the hot floor of the desert and spreading out into a vast, seemingly endless expanse of browns and greys and occasional streaks of rust.

The vegetation was sparse—dusty and brittle looking. The whole scene was like the surface of an alien planet—lifeless and hostile.

The airplane banked for landing and suddenly I saw rectangles of *color* interrupting the drab landscape. As we approached I could discern man-made lakes, groves of date palms and grassy golf courses. This was Palm Springs!

When I stood in the center of our motel complex, looking across neatly mowed lawns and clean sparkling ponds—with those harsh forbidding mountains rising up in the distance—I was impressed once again with the limitless power of the human race to turn any hellish environment into a tropical paradise. "If it can be done here," I thought, "it can be done anywhere."

And I mean *anywhere*!

We can do it in the middle of the Sahara, in the snows of Siberia, under the ocean. And, yes, we can do it *off* the surface of our planet too—in Earth orbit, on the Moon and Mars. Anywhere.

The potential of the human mind to solve nature's problems is not just inspiring chatter—it is a fact. Nothing is beyond our reach; nothing is too difficult; there are no doors that we cannot open.

The one phrase (whatever the specific wording) that always makes me feel revulsion, is "Man wasn't meant to..."

Do you remember the scene in *Lawrence of Arabia* when the men finally reached water and shade after a torturous trip through the deadly sandstorms of the desert? Lawrence discovered that a friend had been left to die in the desert and announced that he would return to bring him to safety. His companions warned him that it was suicide and offered him a rationalization for not going back: "It is written that he should die," they said.

As he turned to go, Lawrence said with firm disdain, "*Nothing* is written!"

For those of us interested in the future of life, it is extremely important to remember that tomorrow is in no way pre-determined. We have the incredible ability to change the shape of things to come and to create places for human happiness anywhere in the universe.

Kerry O'Quinn/Publisher

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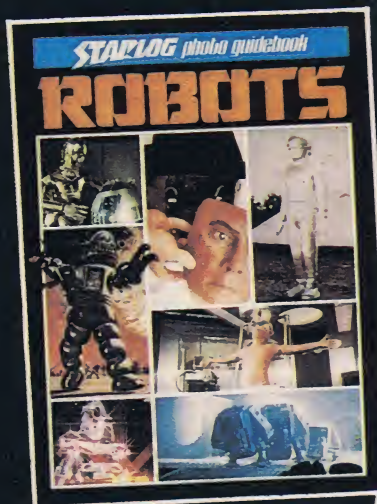
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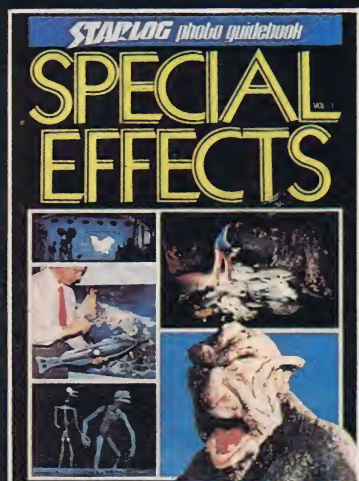
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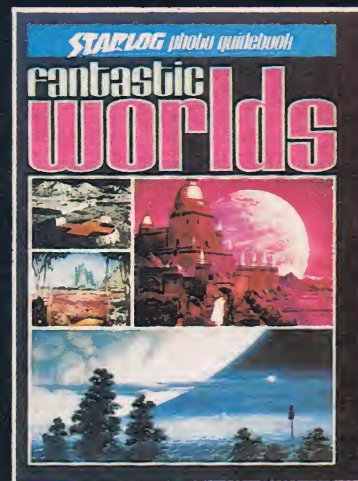
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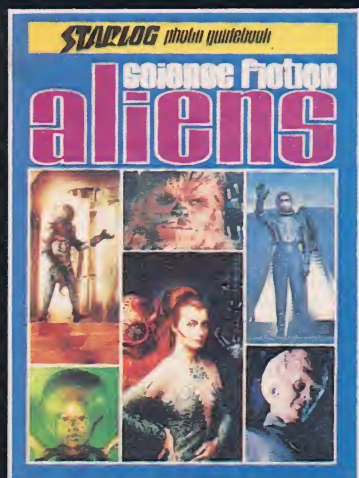
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EUREKA

...I've heard that researchers at Stanford University have discovered a cheaper way to make silicon that will cut solar cell costs 90 percent! This *really* makes solar power practical!

Robert B. Hanson
Minneapolis, MN

See Databank (p.15) for the story.

DNA DICTATORS?

...In your editorial on genetic engineering (FUTURE LIFE #13), you stated how wonderful it would be to choose straight hair over curly, long legs over shorter, and mused over the advantage of four or six arms over two. You also stated that it was an example of "science fiction melding into science fact." If this is true, then the dark side of this "advancement" should be examined.

If genetic engineering is as close as postulated, how close, in fact, are we to the destruction of our DNA molecules, even accidentally, so that test tube reproduction is our only means of replenishing the species (*Brave New World*)? How close, in fact, are we to a new age of "racial superiority?" Instead of the blonde-haired, blue-eyed Aryan giants of an earlier age, will the new Hitler command an army of ten-foot-tall, six-armed, four-legged bald monsters? How close, in fact, are we to *Star Trek's* prediction, in "Space Seed," of a tyrannical world dominated by a group of these genetic "supermen"?

If man is to develop a new pair of limbs, let him do so through the *natural* process of evolution. This way, his mind will have matured, hopefully, past some of his darker tendencies. Without *mental* evolution, man is not ready for the *physical* evolution you've described.

D.C. Gordon
Arlington, VA

FUTURE NOSTALGIA

...I enjoyed your most recent issue of FUTURE LIFE (#13) as usual, and in particular found Futures Past to be the highlight of the issue.

I sincerely hope that Futures Past, with its nostalgic looks at our past predictions, will become a regular installment in FUTURE LIFE. The column could even be expanded to include predictions that have come true—although the 1930s transportation proposals were entertaining enough to deserve a column of their own.

I hope other readers express this opinion to you as well—I'd really like to see a regular thing made of this column. It was quite fun.

George "Mesabi" Perkins
Brookings, SD

STAR EMPIRES

...As a science and science fiction fan since the day I was born, I would like to congratulate

Michael A.G. Michaud on the excellent article he wrote in FUTURE LIFE #13 entitled "Star Empires." I thoroughly enjoyed his way of analyzing the existence, or possible existence, of star empires. I agree with him totally, especially his point that even though man has not yet seen or sensed any star empire, they might just be too superior for us to recognize their presence. It's about time somebody put man in his place. Keep up the fantastic work Michael and FUTURE LIFE!

Ronnie Lajoie
Cranston, IL

GODSEND



ART: © 1979 CLAUDIO MAZZOLI

...The pre-production painting from the Claudio Mazzoli-Gary Goddard "Secret SF Epic in Pre-Production" (Databank, #13) looks most intriguing. May I offer a guess as to the film's premise, based on the painting?

The characters' costumes are obviously Egyptian in design. The climate is hot and arid—a desert. The structures in the background are pyramids—futuristic pyramids. This suggests that the project could be about the proposed extraterrestrial origins of ancient Egypt, à la *Chariots of the Gods*.

But wait—that human figure over to the right looks suspiciously like a young Charlton Heston, as he appeared in a certain well-known Hollywood epic dealing with ancient Egypt. Could Mazzoli and Goddard be planning an SF version of *The Ten Commandments*?

Randy Turnbull
Memphis, TN

ROCK HOUND

...I have just finished Jon Pareles' article "Sound Ideas" in FUTURE LIFE #13. It is exactly the type of thing I have hoped to find somewhere sometime.

Like Michael Moorcock, I too have been hooked on SF-rock and Hawkwind/Hawklords. I would like to add to Jon Pareles' article, for those of you who may be interested in Michael Moorcock and the group Hawkwind/Hawklords. They have in the past collaborated on several songs together, to the extent of Moorcock supplying his voice for a narrative on "The Wizard Blew His Horn" and "Warriors" from Hawklords' *Warriors on the Edge of Time*.

Almost half of the LP is a Moorcock and Hawkwind collaboration. It is also hard to find because it is an English import. Other songs with Michael Moorcock's name include: "Standing on the Edge," "Kings of Speed" (both from the *Edge of Time*) and finally "Sonic Attack" (from both *Space Ritual* and the greatest hits record called *Masters of the Universe*). The last is a song about what you should do in case of sonic attack, just a bit different than what you would do in the case of a nuclear attack.

Thanks again for printing this feature on space-rock and for putting me on the track of all the music you have.

Roger S. Neville-Neil
Honolulu, HI

NEW SOUND

...Thank you for the fine interview that you did with Larry Fast (FUTURE LIFE #12). It should, however, be noted that the third Synergy album was *Cords* (as in patchcords) rather than *Chords* as you reported. Please keep up the good work that you have done in the past in reporting on electronic music.

I would like to respond to the letter from Michael Horwood (FUTURE LIFE #12). If indeed there is a "slant" in FUTURE LIFE toward reporting on musicians such as Rupert Chappelle, Kraftwerk, etc., then that slant is in the right direction. Technological advances will always continue to have an effect upon music. And the present trend of development is toward electronic music. The electronic music of today will definitely have a strong influence on the music of tomorrow. Therefore, FUTURE LIFE should continue to report upon all developments in electronic music.

In addition, all persons interested in electronic music are invited to join the International Electronic Music Association. To join, send a self-addressed stamped envelope to I.E.M.A., PO Box 456, Salamanca, NY 14779.

Daniel D. Segard
Kearney, NE

SYD MEAD ART

...In one of your past issues of FUTURE LIFE you had an article on the work of Syd Mead (#10). In the article you mentioned a publisher was planning to publish a book of his work this fall. Can you give me the name and address of the publisher?

Allan J. Alvarg
Bryan, OH

Syd Mead's new book, entitled *Sentinel*, is being published by *Dragon's Dream*. Priced at \$12.50, the full-color volume may be obtained by writing to Big O Publishing, Box 6186, Charlottesville, VA 22906.

COMPUTER ERROR

...I had never read FUTURE LIFE until recently, but I was intrigued with some of the articles. However, I was disappointed in your editorial "The Incredible Shrinking Computer" (FUTURE LIFE #12). It was well written but incredibly naive. There was a day and age when your analysis was usually true, but no longer. Your assurances that big business would invest in research and development if just given sufficient "excess" profits has significant flaws.

Most sectors of the United States economy (with a few exceptions) are controlled by a few

powerful conglomerates. When they devote funds to futuristic research that could have a significant effect on society it is for one reason—to make discoveries and patent them, thereby removing them from the competitive market (what there is of it). It produces far more profits to keep things status quo rather than change them. Only when there is a reasonable semblance of competition between companies is it worth the cost and risk to come up with new products.

Why do you suppose it has taken so long for the American auto manufacturers to realize that they have to start incorporating technology that has long been in existence? The gas crunch has made consumers put high gas mileage on the top of their shopping criteria when buying a new car. Many foreign cars, particularly the VW Rabbit, get considerably better mileage than any American car. And new car buyers have been flocking to the foreign car showrooms.

How did the American car manufacturers respond to these growing pains of competition? Did

they come out with a more efficient and competitive car? No. Instead they pushed for restrictions on imports. And when that wasn't good enough, they pushed and got high taxes placed on imports, forcing many foreign car prices above domestic prices for cars of comparable size. But the American auto manufacturers are finding that even these tactics are not working. It will not be the availability of "excess" profits that will make the auto manufacturers improve their product; it will be the inability to sell their product.

It is my advice to you that you stick to publishing and leave the economic analysis to people who understand that today's economy bears little resemblance to an economy 100 years ago.

Sara B. McKeever
Fresno, CA

MOONRAKER MISS

...\$30 million doth not a classic make. Case in point: *Moonraker*. Yes, it did have spectacular

sets and whiz-bang special effects. Unfortunately, it also had one-dimensional characters and a non-dimensional plot. As an avid science fiction fan and a follower of 007 since the days of *Dr. No*, I was sorely disappointed.

Sean Patrick
Saratoga Springs, NY

WORLD WAR III?

...Re: Charles Pappa's letter "Blues a Bust," in *FUTURE LIFE* #13:

Does Charles Pappa really believe that the Russians are seriously considering a nuclear attack on the United States in the near future? He says the Russians are doing a lot of civil defense planning. If I was Brezhnev, I'd keep on building those air-raid shelters. When the American Secretary of Defense makes an arrogant statement about sending American troops to the Middle East to "protect" oil that isn't even theirs to begin with, who knows what plans are being planned in the Pentagon to deal with the Russians? President Carter said that the United States is blessed with coal, and it should be used for the betterment of the country. Don't the Arabs have the same right to do what they feel is correct with the oil they were blessed with?

All I know for sure is that if a nuclear war did occur, the innocent, as always, will be the ones hurt, especially if a few ICBMs fall a few hundred miles short of target.

John Herbert
Victoria, B.C., Canada

HOLOGRAPHY HAUNTS

...When I was going back over your article on holography (*FUTURE LIFE* #11), it made me wonder if a similar technique is used in the Haunted Mansions at Walt Disney World and Disneyland. There, the cars pass by a ghostly woman's head talking to you from the inside of a crystal ball and another tiny woman who says goodbye to you on your way out. I don't think either could be their famous animatronics because the movements are too fluid and *look* projected; yet as you go by them, you can see side views, etc. Could it be holography?

Mary Ann Schuller
Springfield, OH

While Disney officials declined to say exactly what process they use to create those effects, they did assure us that it was not holography.

SPACE BUFF

...Are you going to do a piece on the Skylab and Apollo/Soyuz missions? And is there any way of getting some prints of Jack Olson's works?

Charles Sheffey
Charleston, TN

We don't have any Skylab or Apollo/Soyuz articles in the works, since they are more historical than futuristic. But *FUTURE LIFE* #14 featured a painting of the Apollo/Soyuz link-up by Soviet space artist Andrei Sokolov. For prints by artist Jack Olson (*FUTURE LIFE* #12), we suggest you contact Boeing Aerospace Co., P.O. Box 3999, Seattle, WA 98124.

CAPITALISM FOREVER

...I'd like to address myself to Chris Anderson's protest against the pro-capitalist

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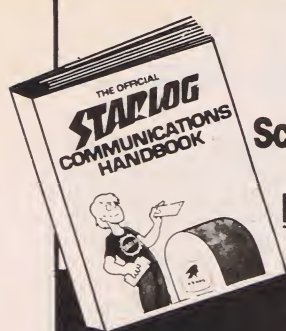
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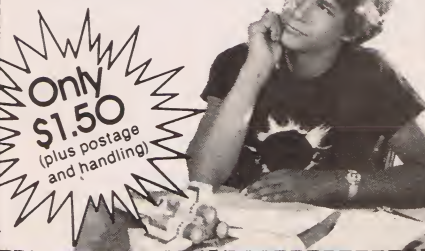
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input

bias of FUTURE LIFE and the L-5 Society (Input, #13). I feel his economic thinking is rather shaky. We will only have a reasonable chance of making the best use of space we need to make in order to survive if the cost of space travel goes down—*radically*. This *must* happen, whether the reduction in cost is the result of private or public research.

Once the cost has been reduced, the resulting cheap space flight will be affordable by a wide range of people and institutions. Under these circumstances, trying to limit access to space will become difficult or impossible, even if it might be theoretically desirable. Efforts to maintain any artificial spaceflight monopolies after that would be expensive, dangerous to both the exploration of space and world peace, and ultimately futile.

It's encouraging to see so much optimism about space flight that people are already arguing over whether it should be public or private. It's also discouraging to see the amount of ink being spilled over efforts to shoehorn the space future into these old fashion categories. I suspect that in the mid- to long-term, only a moderate portion of human activity in space is going to fit any existing scheme of classification.

Finally, even if Mr. Anderson's nightmares about conglomerized space do come true, we *will be in space*. The human species will have taken a long step toward immortality, or at least time to develop all of its capacities—and a laxative advertisement on an L-5 colony is a small price to pay for this step, if we must pay it.

Roland J. Green
Chicago, IL

SPACE BIZ

... Would you have the address of the *Foundation Report*, a space industrialization newsletter?

John J. Prazak
Milton, MA

The newsletter was recently rechristened and is now called Commercial Space Report. Subscriptions to the six-page, monthly publication are \$12 a year. For more information, you may write to The Foundation, 85 East Geranium Ave., St. Paul, MN. 55117.

SPACEPORT PROGRESS

... Do you know where I can get more information about "Earthport—Gateway to the Stars" which was mentioned in FUTURE #5?

Anthony Mackiewicz
Trenton, NJ

We recently published an article containing a complete update on Earthport's development in FUTURE LIFE #12. For a tax deductible contribution of \$15 or more, Earthport will put you on their mailing list of current information. Write to Sabre Foundation, Earthport Project, 221 West Carrillo St., Santa Barbara, CA 93101.

ENTERPRISE IN SPACE

... Being aware of your fine magazine's interest in space activities, I ask your kind assistance in locating any past, present or planned private space enterprises that you may have knowledge of. I am currently compiling information on these types of projects, and would appreciate any help you could give me.

There is only one true private space enterprise I

now have information on. This is the well known West German OTRAG Project, whose activities are so far confined to satellite launching and not space manufacturing. I have heard of a United States-based group under the name of "Space Merchants, Inc." which I think went bankrupt in the early 1970s. I have no detailed information.

There is a consortium of European companies preparing to fund a private satellite launching service using the European space agency's "Ariane" rocket, but this organization is tied too closely to the ESA and thus is not fully independent.

John J. Prazak
Milton, MS

The only other we know of is International Satellite Industries, Inc., a recently formed company dedicated to space industrialization, at 250 West 94th Street, New York, NY 10025.

FEMMES FATAL IN FILM



PHOTO © 1979 20th CENTURY FOX FILM CORP.

... I was disappointed that FUTURE LIFE #13 published a naively favorable review of the SF-horror flick *Alien* (Jean E. Hutcheson's), for it indicates that many people are still unable to properly criticize calculatedly super-promoted movie "events" of our time.

Because of *Alien*'s overt feminist, "liberated" characterizations, Hutcheson suggests that "perhaps people are growing up after all." I would suggest that they are conditioning themselves into new prejudices. She seems to have forgotten that this is a nine million dollar movie, and that feminist overtures may amount to no more than contrived patronizing on the part of Hollywood bookkeepers. Proof of this comes from the fact that Sigourney Weaver's part was originally intended for a man. Crying males and "raised consciousness" sells, baby.

John Clifton
St. Albans, NY

OLD TIMER

... Ah, those two "down in the mouth" letters concerning *Alien*'s "R" rating (FUTURE LIFE #13) bring back memories. I remember not being allowed to see *Planet of the Apes* when I was eight years old because of a rather "dirty" word—and that film was rated "PG." (The word was "bastard.")

So cheer up, 18 is just around the corner. Honest.

Steven A. Showfer
Detroit, MI

PEN PAL POWER

... People keep writing to say that they think the U.S. needs a better space program. What they all should do is pick up a pen and write their senators and representatives and even the

President—they are the ones that can do something about it. Come election time, they should vote for supporters of space exploration.

With everyone's support, our space program could get going.

Tim Erickson
St. Paul, MN

THE FAN MAN

...I would like to suggest another feature for your magazine. I myself like to attend all SF conventions that come to my area (Dallas-Ft. Worth), but there is no set way for me to find out when and where they will be. They are not always announced in the media and even if they are, I might miss them.

If your magazine could compile a special column every issue telling the location of conventions nationwide, it would not only be a big help to me but to all your readers as well.

Otherwise I'll continue to be left out in the cold. I wouldn't want that, would you?

Paul C. Velte IV
Fort Worth, TX

While FUTURE LIFE does not publish convention listings, our sister magazine, STARLOG, does have a monthly convention calendar that provides all the information you need. Feel warmer?

SEEING DOUBLE

...I have been buying FUTURE LIFE from issue #1, and ever since it has appeared, STARLOG and you have been stepping on each other's toes.

Let me explain. Each time FUTURE LIFE talks about an upcoming science fiction film (*Alien*, *Moonraker* and *Buck Rogers*, for example), it is a sure thing that STARLOG will feature the same article except that the name of the author will be changed and the article will be altered a bit.

It seems to me you could have figured out by now that the same people who buy STARLOG buy FUTURE LIFE. Speaking for myself, I don't like to read the same thing twice.

Marc Tessier

Drummondville, Que., Canada

Seems to us you could have noticed that, since there are two distinct magazines involved, there is a noticeable difference in coverage in terms of detail, editorial slant, etc. No one likes to read the same same thing twice twice.

TABLOID OF THE GODS

...Recently, the National Enquirer published an article called "Damaged Alien Spacecraft Is In Orbit Around Earth." The article says the Russians first discovered it and both the U.S. and Russian scientists do confirm its existence.

About December 18, 1955, there was an explosion aboard the spacecraft but the hows and whys are unknown; the ship broke up into ten pieces and are now in orbit around our world; the approximate size is about 200 feet in length.

Dr. Myron Malkin, director of the space shuttle program at NASA's Office of Space Technology said (according to the article), "We would consider a joint U.S.-Soviet salvage mission if the Russians approached us."

If any one of those pieces were brought down to Earth for examination, it would prove the find of the century.

William Schlaak
Wautoma, WI

DREAM-COME-TRUE

...I have recently seen the *Battlestar Galactica* exhibit at Universal Studios, and am rather impressed by their use of laser light. I am very interested in laser light and would like to know how it is projected, what its limitations are, and so on.

I am writing in hopes that you will consider running an article about these harmless lasers and perhaps explain how one could make a projector in his own home. Thank you.

Scott Alberts
Santa Barbara, CA

We can fulfill your request not once, but twice! In FUTURE LIFE #11, we featured an article about holography, three dimensional art produced by lasers, which included a quick lesson on how to make a hologram. And issue #14 included feature about Laserium, a new and exciting art form using lasers. Building your own laser might be tough, but low-power lasers are commercially available.



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Ron Miller's artistic version of Saturn as seen from its moon, Titan, (left) and a Pioneer photo of Saturn with Titan visible above.

PIONEER SHOWS THE WAY TO SATURN

Last summer we got our closest look at Saturn, the uncontested favorite subject of space artists and amateur astronomers for centuries. Pioneer 11's view of Saturn was one never seen from Earth, with the sun lighting the rings from behind and revealing their structure more clearly than ever before. The discovery of new rings beyond those visible from Earth, stretching to the planet's cloud tops and far beyond into space, added weight to a theory that the rings are actually one continuous sheet of varying density. More important for space probes that will follow Pioneer 11 to Saturn: proof that the rings do not present an untraversable hazard. In the summer of 1981, Voyager 2, which flew by Jupiter earlier this year, will follow Pioneer's path through the Saturnian system, picking up a gravity assist to speed it on to an encounter with Uranus in 1986.

"We can report to Voyager 2; the way is clear, come on through, the

rings are great!" said A. Thomas Young, deputy director of NASA's Ames Research Center, which managed the Pioneer Saturn project.

Pioneer 11 also spotted a previously unknown moon in a close orbit around Saturn. First dubbed the Pioneer Rock, it has now been formally designated S11. Unfortunately the spacecraft's measurements of Titan, the seventh and largest moon of Saturn, were garbled by a combination of intense solar storms and bad weather over Earth-based tracking stations. Larger than the planet Mercury and known to have an atmosphere, Titan is of special interest to scientists because it may harbor primordial chemical compounds which are the precursors to primitive life forms. But Pioneer contributed little to further knowledge of Titan.

Compared to the stunning Voyager portraits of Jupiter beamed back this year, Pioneer's images of Saturn seem lackluster. The contrast is partly due to the fact that Saturn is more subtly colored than Jupiter, probably because at twice Jupiter's distance from the sun, colder temperatures keep Saturn's cloud tops relatively

static. Pioneer did observe faint horizontal bands in Saturn's pale yellow cloud cover, and early images revealed faint traces of blue-green and brown tinges, as well as hints of the whorls, scallops and jet stream features observed on Jupiter.

Saturn will come in clearer next fall when Voyager 1 arrives there. Equipped with more sophisticated instruments and a far superior imaging system, the Voyager spacecraft

will uncover more of the mysteries of Saturn and its moons—and return much better pictures of the romantic ringed planet.

Meanwhile, Pioneer's pathfinding mission is complete. It has shown the way for all the spacecraft that will follow it through Saturn's ring system, and now it sails serenely toward the interstellar medium—which it should reach in about 40 years.

—Robin Snelson



Saturn's rings, seen in detail never visible before, backlit by sun.

ART: © 1978 RON MILLER

PHOTOS: NASA AMES RESEARCH CENTER



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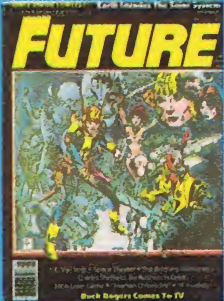
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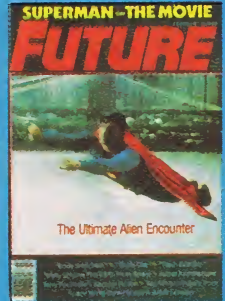
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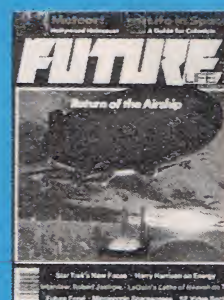
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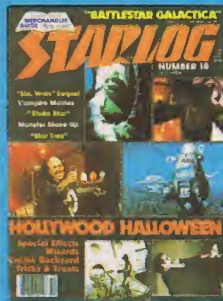
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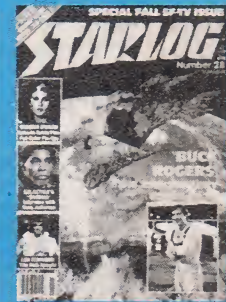
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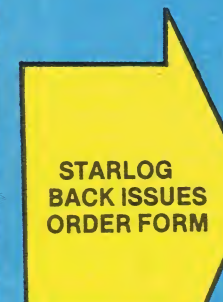
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NEW IMPROVED SUN

Among Skylab's many achievements, the now-defunct space laboratory provided scientists with a wealth of material concerning our solar system's most potent energy source: the sun. Along with the informational data, which will take years to fully analyze, the project provided us with computer-generated photography as beautiful as it is fascinating.

The George C. Marshall Space Flight Center has prepared a collection of these truly spectacular photos (some of which are shown here) entitled *A New Sun: The Solar Results From Skylab*. The full-color, 198-page volume also includes an easy-to-understand explanatory text by John A. Eddy. It is available by ordering document number NASA SP-402 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402; the price is \$10.50.

—Barbara Krasnoff

Right: The beautiful images of a variety of solar prominences are the result of computer processing of photos taken in different spectrums of light. Besides simply pleasing the eye of earthbound viewers, the computer processed images have provided enormous amounts of data for scientists studying the workings of the sun.



PHOTOS: NASA (FROM A NEW SUN, THE SOLAR RESULTS FROM SKYLAB)

FLASH! 'BUCK' FUNNY, 'BATTLESTAR' NOT

This season, NBC-TV has seen fit to unleash *Buck Rogers* on an unsuspecting public. Starring Gil Gerard, Erin Gray and Pamela Hensley, *Buck Rogers* is the brainchild of Universal's Glen Larson who, last season, produced the epic science fiction stillbirth, *Battlestar Galactica*, for ABC. Some NBC executives, it seems, are worried that harried viewers may confuse the two shows, inasmuch as some of *Buck*'s special effects footage and space hardware is strikingly similar to some of *Galactica*'s.

Not to worry. In a recent issue of *Daily Variety*, Pamela Hensley, who plays the series' resident villain Princess Ardala, established once and for all the differences between the ill-fated *Battlestar* and the newly touted *Buck*. "There is not one philosophical or serious thing about it (*Buck*)," she said. "The difference from *Galactica* hopefully will be in the humor of the characters throughout. *Galactica* became increasingly serious. It tended to deal



PHOTO: © 1979 UNIVERSAL

Pamela Hensley, who plays Princess Ardala in television's *Buck Rogers*, says the show is strictly for laughs.

in serious political subjects. Also, a limited number of people liked the hardware. It tried to be sci-fi with contemporary problems. Our show is not serious. It's very campy and in the spirit of *Gilligan's Island*..."

Funny, that's what most critics said about *Battlestar Galactica*.

—Charles Bogle

NO NUDES IS GOOD NUDES

Intrepid secret agent Maxwell Smart will grin and bare it next year when Universal Studios release *The Return of Maxwell Smart*, a full-length spy satire based upon the beloved NBC-TV show of yesteryear. Starring Don Adams as Secret Agent 86, Maxwell Smart, *Return* tells of the efforts of villainous agency KAOS and its efforts to bombard the Earth with a weapon capable of systematically destroying all known fabrics across the globe... the Nude Bomb!

It's up to Max and his three assistants, Agent 36 (Pamela Hensley), Agent 22 (Andrea Howard) and Agent 34 (Sylvia Kristel), to thwart KAOS' attempts. As the foursome journeys around the world on their trek, they run across (sometimes literally) Eugene Roche as the intrepid Chief, Bill Dana as fashion designer Jonathan Levinson Seigle, Robert Karvelas as the original show's popular Larabee and Vittorio Gassman as evil KAOS operative Nino Salvatore Sebastiani.

Aiding Smart in his search for the naked truth will be a horde of gimmicks and gizmos requiring over 118 special mechanical effects. One of the craziest of Smart's concoctions is the Deskmobile; an actual office desk, featuring a blotter which folds into a windshield and dashboard, and is capable of speeding along highways at a sprightly 40 miles per hour.

The Return of Maxwell Smart is being directed by Clive (*What's New Pussycat?*) Donner from a skin rash come up with by Arne Sultan, Bill Dana and Leonard Stern. Okay. Would you believe a social disorder by Sultan, Dana and Stern? How about a screenplay? —Joseph Kay



PHOTO: © 1979 UNIVERSAL

SOLAR CELL BREAKTHROUGH

A significant breakthrough by scientists at California's Stanford Research Institute has brought us one large step closer to economic solar energy.

Silicon, a common element which is chemically derived from ordinary sand, is a key element in the manufacturing of solar cells. Up to now, the cost of processing one kilogram of silicon was about \$60, a prohibitive expense which had contributed to arguments that solar power was economically unfeasible. However, the new one-step method discovered by Stanford researchers can produce this same element for only \$5 per kilogram—a substantial difference. According to the institute's report, "The real value of this new one-step process may be that it enables solar energy experts to direct their attention and funds to the remaining challenges."

Interestingly enough, the discovery came as a total surprise to both the Department of Energy and NASA. These two government agencies had

commissioned the Stanford Research Institute to develop, by the year 1986, a two-step method of producing silicon at a cost of \$10 per kilogram. Instead, the institute provided this one-step method, at half the projected cost, seven years before the agencies' target date.

However, since SRI undertook the successful research project independently, it owns the new low cost process.
—Barbara Krasnoff

SOVIETS SHATTER SPACE RECORD

The newest record for longest human spaceflight is 175 days, 36 minutes.

Snug in a 19-ton Salyut space station, Soviet cosmonauts Vladimir Lyakhov and Valery Ryumin chalked up a planet-circling 72.2 million miles—the equivalent of a round trip to Mars when it's closest to Earth.

Launched in their Soyuz 32 spacecraft earlier this year, the pioneering team linked with the larger Salyut station, and broke the previous orbital endurance mark by over a month.

The exploit resulted in significant strides by the innovative Soviet space program. Experiments with growing plants in artificial gravity; space processing; successful tests of refueling in orbit; evaluation of life-support apparatus; and elaborate medical investigations, were carried out aboard the laboratory.

The cosmonauts were visited by robot controlled supply ships, carrying cargoes of books, water, rocket fuel, newspapers and mail, fresh fruit, vegetables and even a television set. The pair remained alone for the nearly half-year tour of duty; a planned visit by two other cosmonauts was aborted due to mechanical failure.

At one point during the flight, a radio telescope was unfurled from the Salyut, the first deployment of a large space structure from a manned vehicle in orbit. Using the 33-foot diameter antenna, a survey of the Milky Way was accomplished.

Although the team was given a medical A—O.K., in addition to the highest Soviet medal, *Heroes of the Soviet Union*, the long period of weightlessness did produce side effects. Initial reactions of the cosmic voyagers as they reacquired their

Earth-legs included an "uncomfortable" feeling in normal gravity and difficulty in articulating words. Slurred speech has not previously been encountered. These effects apparently are not long-lasting.

As to future Soviet exploits in the cosmos, experts see continuing progress leading to permanently manned stations, with larger numbers of crew and linking of several advanced Salyuts.

With cosmonauts orbiting for longer periods of time, some observers suspect that extended planetary travel is a gleam in the eyes of Soviet space planners. Such a flight "could make our job in the Congress of funding the space program easier," believes Representative Bill Nelson of Florida, a member of the House Science and Technology Committee. The competition "could very well help the U.S. space effort," states Nelson.

This view is not shared by all. Last year, President Carter's science adviser, Dr. Frank Press, said, "If they [the Soviets] want to send men to Mars, we say god bless them." Adds one space policy watcher, "Let them have Mars. Who cares? It's red already."
—Leonard David

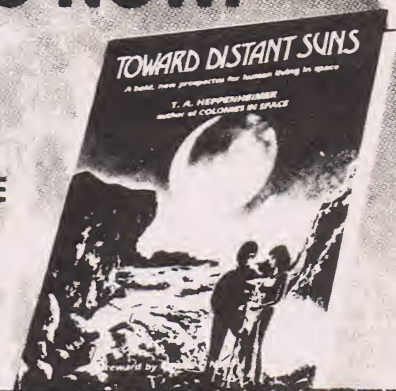
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SCARING DOLPHINS

"It's not easy to fool a dolphin," Japanese fishing experts say, but they keep trying in an effort to scare them away from prime waters.

Japanese fishermen call dolphins "gangs of the sea," and kill large numbers of the sea-going mammals, which some scientists believe may be as intelligent as humans. Environmentalists worldwide have protested the frequent slaughter of the dolphins, but there is another side to the story. Dolphins eat an estimated \$2.5 million worth of fish and squid each year.

In an effort to solve the problem and prevent further outcries, Japan is spending \$185,000 trying to find a way to scare the dolphins away from Japanese fishing waters.

Recently, the Japanese Fishery Agency tried frightening the dolphins with a plastic killer whale—one of the dolphins' natural enemies—that played tape recorded whale songs. But the ruse failed. "Dolphins learn quickly," an agency expert said, making it difficult to fool them.

From earlier experiments, however, the agency learned there are certain sounds the dolphins may recognize as artificial, but won't be able to tolerate. Dolphins "see" via a sophisticated sonar system, translating echoes from their clicks and whistles into sound pictures of the underwater environment. One of the reasons they have such large brains is to process this sound information. It is possible that certain sounds may interfere with this natural sonar, confusing and frightening the dolphins.

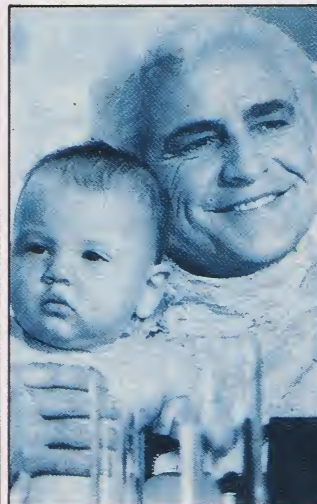
Sound experts are now testing a variety of radio signals on 30 dolphins trapped in a bay of Iki Island (about 400 miles from Tokyo).

"We're hoping the dolphins will go someplace else and, please, eat less valuable fish," says agency sound expert Yoshimi Hatakeyama. —Allan Maurer

SUPERDAD AXED FROM SUPERMAN II

Marlon Brando has reportedly been written out of the script of *Superman II*, the sequel to last year's successful *Superman—The Movie*. Brando's unscheduled departure is the latest in a series of strange occurrences surrounding the sequel. Problems with *Superman II* began almost immediately after the release of *Superman—The Movie*. Director Richard Donner and producers Ilya Salkind and Pierre Spengler just couldn't come to terms in negotiating a Donner deal for the second film. Donner, who almost single-handedly saved the first film from ruin after the multi-million dollar production got off to a false start, had his own ideas about the second movie. He reasoned that, with artistic freedom assured, he could deliver an adventure film even more exciting and profitable than the original.

The producers, never all that impressed with Donner's individualistic streak, disregarded his demands and opted for another director instead. This development, in turn, upset most of the original



Next time around, smiling Marlon will be snubbed by his successful super son.

movie's cast and crew, most notably super star Chris Reeve, who expressed total admiration and respect for Donner as a creative force. Production on the film was delayed while the producers wooed another director. Before too long, Reeve was involved in a legal battle with the producers and appeared on a segment of NBC's *Tonight* show fretting publicly over whether or not the

sequel would be helmed by "some bozo."

Eventually, Reeve came to terms with the producers. Richard Lester took over the director's chair for the sequel (although the second film will still be labeled "A Richard Donner Film"... figure that one out).

So far so good. Everyone assumed that the making of *Superman II* would be relatively painless since Donner had effectively shot 85 percent of the second film while lensing the first. Then, with production only weeks away, the producers leaked the news about the Brando exile.

According to sources on the *Superman II* set, Brando (Jor-El) will be replaced in the new story line by his Kryptonian wife Lara (Susanah York). This switch means more footage and more time will have to be devoted to the second superfilm. The reason for superdad being ousted in favor of supermom? Money. Rumor has it that the producers weren't eager to pay Brando a hefty percentage of the sequel's profits as they did on the first go-round, so a hasty re-write was called for.

Unsubstantiated rumors are also circulating that, in order to keep flying costs at a minimum, the producers will outfit Superman with Kryptonite shorts. —Gerald Morris

LASER FAIRY

Technology has struck again, this time on Broadway. In the latest reincarnation of the musical *Peter Pan*, the role of Tinkerbell, the minuscule fairy traditionally represented by a beam of light, is now being played by a modern-day marvel: a laser.

This new addition to the well-known children's play was first conceived by producer Zev Bufman, who thought that it would give Tinkerbell a more three dimensional and lively aspect. He therefore hired Laser Media Inc., whose credits include the



1977 *Star Wars* Symphonic Concert at the Hollywood Bowl and the special effects for the upcoming film *Altered States*.

Randy Johnson, who operates the argon laser being used in the show, asserts that the laser look is effective.

"We're using a butterfly shape, after Walt Disney's conception of Tinkerbell," he explains. "The laser can create an image that has expression. We can spin it, strengthen or lessen its intensity. To the audience, it's something very special. It looks quite magical."

Clap if you believe...

—Barbara Krasnoff

Tinkerbell twinkles scientifically.

SPACE-AGE ENERGY SAVER

When unenlightened friends ask snidely, "Well, what has the space program done for me?" you can do better than pointing to such futuristic-sounding benefits as orbiting solar power satellites or Moon mining. Many new consumer products directly attributable to NASA research are on the market today.

For instance: Part of the makeup

of the Saturn launch vehicle was a small metallic disc called a thermister which was used to protect the delicate equipment from any sudden increases in energy. This same device is now the heart of a new product being marketed to protect the consumer from any sudden increases in energy costs. Dubbed the Bulb-Miser, the disc fits directly onto the light socket of any household fixture and, by impeding the initial power surge that occurs when the light is switched on, will extend the life of almost any bulb by as much as four times. This can represent quite a considerable savings, not

only for ordinary home lamps, but especially to the owners of factories and large office buildings that use large amounts of electric lighting. The Bulb-Miser, which costs \$2, can be obtained by writing the American Electro-Dynamics Corporation, One Penn Plaza, Suite 2830, New York, NY 10001.

Not quite of earthshaking importance, you say? Perhaps not obviously—but, in the long run, such space program spinoffs may do as much to improve our standard of living as more highly-touted gadgets.

—Barbara Krasnoff



IDENTIFYING UFOs

The next time your car is buzzed by a cigar shaped object and you want to find out for certain whether you have been assaulted by a genuine UFO or a kamikaze tiparillo, try browsing through two new tomes devoted to extraterrestrial craft: *The UFO Handbook* and *UFO Terms*. *The UFO Handbook*, published in paperback by Doubleday and priced at \$8.95, is a self-proclaimed "guide to investigating, evaluating and reporting UFO sightings" compiled by UFO researcher Allan Hendry. A serious work, with a forward by J. Allen Hynek, director of the Center for UFO Studies, it offers neophyte investigators loads of helpful hints under such mind-boggling headings as "What To Do After A Sighting," "The UFO Imposters: Kite Wire," "UFOs Are Unique Because They Make No Noise Or At Least Very Little Noise" and "Why Do UFOs Always Leave Before Investigators Can Get There."

If your curiosity isn't assuaged by



Drawings from
UFO Terms:
Know your ETS

the *Handbook*, try *UFO Terms* on for size, a mercilessly endless collection of definitions culled by Robert Stevenson Somerville who is the director of the UFO Schools of Warren, Michigan. Sold by the Schools at \$7 per paperback copy, the book begins with a quote from child star Quinn Cummings who remarked to Johnny Carson on the *Tonight Show* one evening, "Wouldn't it be awfully selfish to think we were the only ones in the Universe?"

From that introduction, the book

strives for even loftier goals, offering such dazzling definitions to the novice UFO expert as "Earth: A spaceship with a limited life support system which is being recklessly used up," "Potato Sacks: Life forms seen crossing a road resembling people crawling along in potato sacks," "Werewolf: (rare) A UFO occupant with a head slightly resembling a German Shepherd, especially the ears," and "Mystery Balls: Metal balls occasionally found in odd places throughout the world."

UFO Terms is lavishly illustrated with pen and ink sketches that appear to have been executed between periods of basket and clay therapy sessions by residents of a state-owned institution. So out of this world is *UFO Terms* that UFO Schools has, as this issue goes to press, recalled it for a little while to correct "numerous typos and a few information mistakes." Next time your car is buzzed by a cigar-shaped object, shrug and swear it was a tiparillo. It'll save everyone a lot of trouble. —Ed Naha



JULY 12, 1977
QUEBRADILLAS,
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SHARK MARSEILLAISE

Jaws author Peter Benchley likes to say, "Sharks aren't evil... they just want to eat you." Marine biologists at the University of Delaware have a solution to that problem: eat them first.

The Delaware Sea Grant Advisory Service highly recommends shark meat, noting it is a good source of protein and vitamin A—and tasty besides. While some sharks, such as the Great Whites, may be an endangered species, others are plentiful. Approximately 62 species swim the waters off the east coast of North America. They average three to seven feet in length, and most weigh less than 1,000 pounds, but two fishermen recently brought in a Great White caught off the Atlantic coast that was 13 feet long and weighed 2,100 pounds.

Commercial shark fishing is not as profitable as it used to be when shark liver was used as a prime source of natural vitamin A, and shark skin, which has sharp, tooth-like projections, was used by cabinet makers to polish wood. Synthetic vitamins and abrasives have replaced both these functions.

But the shark itself is becoming more popular as a food source. Dog-fish shark caught by Norway fishermen often ends up as the fish in British "fish and chips." In Japan,

shark steaks often serve as a main dish, and shark fin soup is considered a delicacy. Mexicans on the Yucatan Peninsula like filets cut from young sharks. Even the meat of the aforementioned Great White "was eaten," according to the fishermen who brought it in.

The Sea Grant Service offers a brochure and other information on catching, cleaning, and preserving shark for food, complete with recipes such as "Oven-fried Shark," "Blue Fin Latino," "Shark Marseillaise," and "Poached Shark Remoulade."

Now, doesn't that make your jaws water? —Allan Maurer



Allen Lo and Jerry Nims in 2-D.

INVENTORS DESCRIBE 3D POCKET CAMERA AS "REVOLUTIONARY"

Science fiction writers have long been fascinated with the possibilities of three-dimensional photography, but up to now the public has shown only passing, faddish interest in the medium. Next year, however, a pocket-sized 3D camera developed by two inventors in Atlanta may make "tri-d" pictures common.

Inventors Jerry Nims and Allen Lo describe their camera as "revolutionary." Currently available 3D systems are plagued by a host of problems: the need for either heavy

(1,000-pound camera) equipment or special viewing devices such as stereoscopes or glasses; and technical difficulties that lead to frequently unsatisfactory results no matter what system is used. Nims, who spent eight years in Japan printing 3D postcards that used thick, lenticular screens joined with the photos to create the multi-dimensional effect, said results "were often so poor we called them 2½D."

The deceptively simple-looking Nimslo camera will change all that, the inventors say. Comparable in size to conventional pocket-cameras, it has four lenses spaced about half an inch apart to simulate the distance between a normal person's eyes. It will take ordinary film that users will have to send to Nimslo for processing. But the prints or slides produced

by the Atlanta firm require no special viewing devices and are on paper of ordinary thickness coated with a special viewing screen. The results are spectacular. A photograph of a hamburger literally looks good enough to eat. You can almost smell the grease.

Initially, the camera will sell for about \$400, and prints will cost 55¢ each, but Americans might have to wait a few years before they are readily available at the local camera store. European camera markets are "more stable than America's," a London camera dealer explained to *Business Week*. "You don't get the suicidal discounting typical in the U.S." So the makers plan to market the Nimslo camera in Switzerland in 1980.

Eventually, the inventors say, their company, Dimensional Development Corporation of Atlanta, will market both 110 and 35mm models of the camera worldwide. Because the cameras nearly duplicate the way light strikes the eye and is processed into a stereo image by the brain, the Nimslo system may also have applications beyond putting 3D snapshots in family albums.

Doctors, scientists, and advertising men may find 3D photography a valuable new tool, a company spokesman suggested. And, of course, in the entertainment field, a convenient 3D process could have important implications: Can you image the *Close Encounters* mothership, *Star Trek—the Fifteenth Movie*, or *Star Wars Ten* in realistic, eye-popping 3D? —Allan Maurer

ATTENTION SPACE PIONEERS:

HELP PLAN "CAREERS IN SPACE" CONFERENCE 1980

"Where do I sign up?" is a favorite question of would-be space pioneers. Today, however, there's no place you can just walk into and sign up for a job in space. But there's hope on the horizon. With the U.S. space shuttle about to begin regular Earth-to-orbit service, with the Soviet Salyut-6 space station's cosmonauts conducting space manufacturing experiments, the European Space Agency Spacelab nearly completed and a Japanese space shuttle on the drawing boards, experts are predicting hundreds to thousands of jobs in space will open up in the next 10-20 years, with many more space-related jobs on the ground. If your interests are not in science or technology, don't feel left out. There will be careers in space in many other areas.

What will these jobs be and how do we get in line for them? The L-5 Society and the American Astronautical Society are organizing a three-day conference, "Careers in Space," to be held in San Francisco in late June 1980 to help answer that question.

Topics to be covered will include what careers will be opening up, how and where to train for these careers, and—most important—what we can do to push the New Space Program which is going to create these jobs in orbit.

This conference will provide low cost housing and food, so you won't have to be a fancy executive in order to attend. We plan tutorial sessions to provide you with a basic background in several career areas so you can better choose your occupation of the future. Evenings will be reserved for fun!

Let us know what you'd like to get out of this conference. Please send the questionnaire below and any additional comments to:

Careers in Space
c/o L-5 Society
1620 N. Park
Tucson, AZ 85719

name _____

street address _____ city _____ state _____ zip _____

The careers in space in which I am interested are:

- _____ space transportation
- _____ space station/habitat design and construction
- _____ power satellites
- _____ communications satellites
- _____ remote sensing
- _____ materials processing
- _____ mining of Moon and asteroids
- _____ computers
- _____ scientific research
- _____ law
- _____ management
- _____ mental health
- _____ medicine
- _____ behavioral sciences

- _____ business
- _____ government
- _____ entertainment
- _____ arts/architecture
- _____ food preparation
- _____ agriculture
- _____ other life support
- _____ other (please list) _____

I would like to enjoy the following evening conference activities:

- _____ music (what kind?) _____
- _____ dance (what kind?) _____
- _____ exciting lecturers (who?) _____
- _____ debate (who? what?) _____
- _____ tours (where?) _____
- _____ other (please list) _____

I want to push the New Space Program by learning how to:

- _____ organize a local L-5 chapter
- _____ conduct community education programs with displays, information booths, lectures, film festivals, etc.
- _____ influence the media
- _____ influence politicians
- _____ influence public opinion
- _____ develop private enterprise space activities
- _____ initiate a space education program at my local college or high school
- _____ other (please list) _____

My major areas of interest are _____

My occupation is _____

My level of education is _____

My age is _____

_____ Please put me on your mailing list for Careers in Space Conference news updates.

*A public service announcement,
courtesy FUTURE LIFE Magazine.*



Lovers, Colonists & Explorers

Scenarios for Space Settlers

By T.A. HEPPENHEIMER

Space tourism might begin even before there is a space colony, with the building of an orbiting vacation resort. In 1967, at a conference of the American Astronautical Society, the hotel entrepreneur Barron Hilton (son of Conrad) stated that if space transport costs fell to \$5 per pound, he would build a hotel in orbit. Actually, inflation has turned Hilton's \$5 per pound into what in today's dollars would be more like \$10. With reasonable provision for baggage

and for the food and oxygen to be used by the orbiting tourists, a round-trip ticket then might cost \$4,000 or so. This is not much more than twice the cost of a round-trip transatlantic ticket on the Concorde and is similar to the costs charged for many cruises by ship. Since the Cunard Line has successfully sold tickets for their most luxurious round-the-world cruises at up to \$97,000, the potential is obvious.

The possibility of a space hotel then rests,

as does so much else in space, on the availability of low-cost rockets. An entirely new form of engine, the scramjet, offers the prospect of an aircraft that will fly to orbit as if it were a fast jet plane. The day will come when vacationers can reserve seats on such a craft on a flight out of Miami to orbit.

What a flight that would be! Using turbojet engines, the plane would fly to open ocean, where supersonic flight would produce no annoying sonic boom. At Mach 2 the jets would shut down and the scramjets take over. Passengers would not notice much, but they would continue to feel the acceleration as the plane gathered speed. Through their windows they could see the sky turn a deeper, deeper blue. Soon it would shade off into virtual blackness, and the curvature of the Earth would be evident. There would be no vibration, no harshness of ride, but on the cabin bulkhead a digital Machmeter would display the increasing speed: Mach 6, Mach 8, and on up as high as Mach 14.

At that speed, and at 120,000 feet altitude, it would be the scramjets' turn to shut down. In the rear of the aircraft, rocket engines now would thunder to life. With the hardest part of their job already done, the rockets would soon drive the travelers the rest of the way to orbit. The craft would dock with the orbiting hotel, and the passengers could deplane and seek their staterooms.

In the hotel lounge would be large windows offering excellent views of both Earth and

Above: A single-stage-to-orbit spacecraft switches to scramjets as it leaves Earth's atmosphere, taking passengers to orbit.



Later generations of space colonists may attach star drives to their habitats and move entire communities to other solar systems.

space. With telescopes and cameras, or merely sitting in comfortable chairs, the vacationers could sit enthralled as their planet passed below. Awesome would be the sunrises and sunsets, every 90 minutes, as the sun spread its waxing and waning light across the world or made incarnadine the lower air. The land would offer a never-constant panorama: now the deep reds and yellows of the Sahara, then the dark green of the Amazon rain forest, and again the cloud-speckled blue of the sea. The Himalayas—those majestic mountains spanning the view, yet which one is the Everest Hillary and Tenzing struggled to climb? The astonishing crystal greens of shallow tropical seas near Bermuda, near the islands of the Pacific. An anvil-shaped thunderhead towering above an expanse of white cloud over Kansas. The great cities of America and Asia, glowing

with light amid the nighttime darkness. The feathery watershed of a great river in spring. And always, on the horizon, the light blue where the sky is below.

When they turn away from their Earth-watching, the tourists will find a number of unique attractions. Since artificial gravity can be set to any level simply by controlling the rotation rate, many Earthside sports and games will take on an entirely new character. For instance, there could be a circular jogging track, on which people could run in the direction opposite to that in which the track is spinning. As a jogger would speed up, his weight would go down, since he would be counteracting some of the centrifugal force that was holding him down. If his pace was fast enough, his weight would vanish entirely, and he might find himself kicking vigorously while slowly rising into midair.

Water sports would take on an entirely new character. A low-gravity swimming pool would resemble an enormous, slowly rotating barrel with water all along the inside of its periphery. Someone swimming there could look up and wave to his friends directly overhead, for he would see the water arching uphill to left and right, then continuing overhead to form the interior of the barrel. Swimming with the aid of flippers need not be limited to the water. A swimmer could launch himself upward from underneath, break the surface like a dolphin, and then continue upward into the air. The flippers then could serve as little wings, further propelling and steering the swimmer as he sought to reach the center of the barrel. Ordinarily he would not succeed, and would slowly lose speed, then fall back. But a few would achieve zero-g. There they could float and relax, watching

the scene around them.

Human-powered flight could be a most novel and pleasurable sport if the orbiting resort grows large enough. The aircraft would resemble hang gliders, but with a propeller turned by bicycle pedals. The daring aviators could start their flights near the center of a large rotating enclosure, where the artificial gravity or centrifugal force would be weak and the pilots could get a good start. Thereafter, the challenge would be "how low can you go." By swooping low, outward from the center, the artificial gravity would increase, and pilots would need more and more effort to maintain the margin of power for a return to the central low-gravity regions. Of course there would be no danger if someone dipped too low, he would simply glide to a landing on the inside of the enclosure. Still, this would prove quite embarrassing on occasion, especially to someone who wanted to show off.

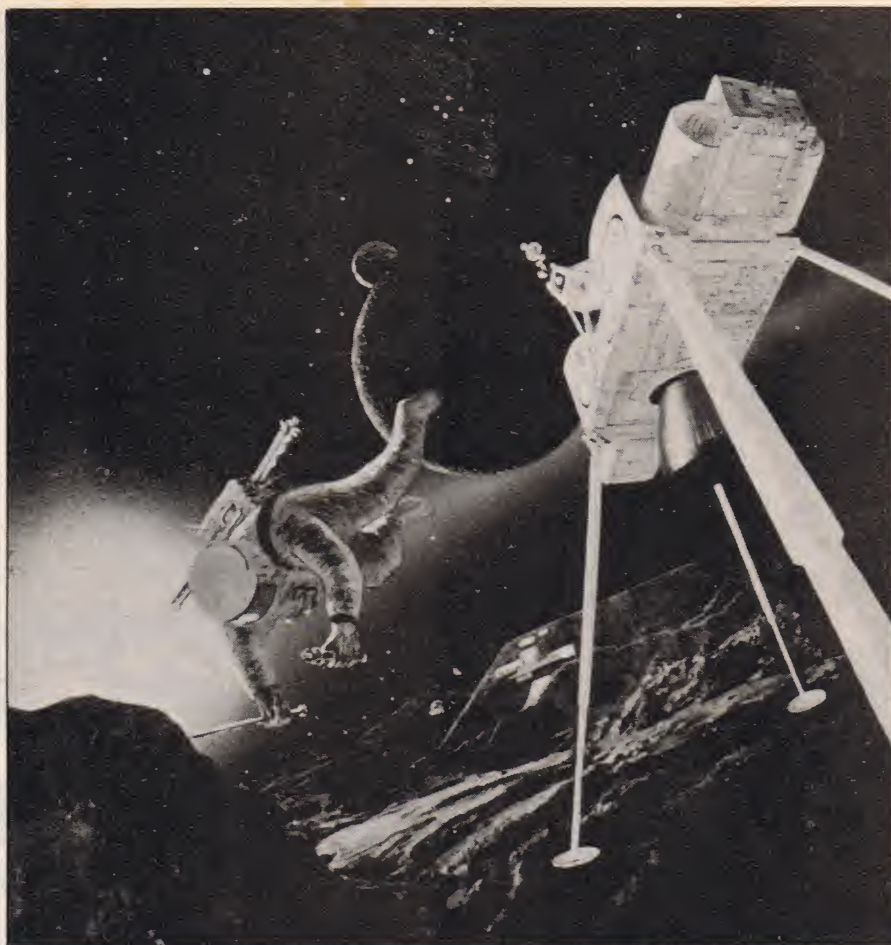
Even with less elaborate wings, tourists will find opportunities to take advantage of zero-g to fly after the fashion of birds. Many vacationers will practice for hours or days till they understand how to control their flight, and thereafter will treasure the home movies or Polaroid photos that will attest to their skill. Yet there will be those for whom these memories will be far from the strongest. Some will seek activities of a very private nature, which may leave them little time for the views from the lounge or for sports.

Among the most popular attractions will be the opportunity for sex in zero-g. Here will be the chance for lovers to try out all the positions that proved uncomfortable or difficult back home, even in a waterbed. The Hindu love manual, the *Kama Sutra*, will doubtless be popular reading; with good reason, it will be on sale in the airport departure area. Some *Kama Sutra* experts like to try out difficult positions in the water first, but they will find that space is much better.

Neither partner can be on top or on the bottom when there is no up or down. It will take a lot of cooperation for novice couples to stay locked together, and this will prove easier with the aid of an elastic support. This will be a situation unimagined in the Middle Ages, when the lady of a knight wore a chastity belt; what will be needed here is an unchastity belt, to keep the couple coupled. It may be of pink latex or nylon, with holes for four legs, somewhat resembling a set of underpants to be worn by a baby elephant. However, it will be worn by a rather different animal, Shakespeare's "beast with two backs."

More experienced couples will dispense with such artifices and rely on the woman to wrap her legs around her man, then to move her body in appropriate ways. A man may prove quite inventive, grappling his woman's thighs with his knees so as to thrust into her. Others will find various ways for a woman to sit astride her man, facing either forward or backward. And so the long night will pass.

And how good it will be, after the loving, to fall asleep still holding each other in one another's arms, with no gravity to press the weight of one heavily on the other, or to cut off circulation in arms that would embrace.



The mining of asteroids will provide the raw materials for building space habitats.

As time goes by, there will be many couples who will make love in this way, and many thousands of people who will sample these pleasures of life in space. In the meantime, the space colony will be developing and its people building their power satellites. There will naturally be the question of bringing to the colony the pleasures and amenities of such an orbiting resort. With an imaginative colony leadership, they could be the basis for the next phase of colony growth.

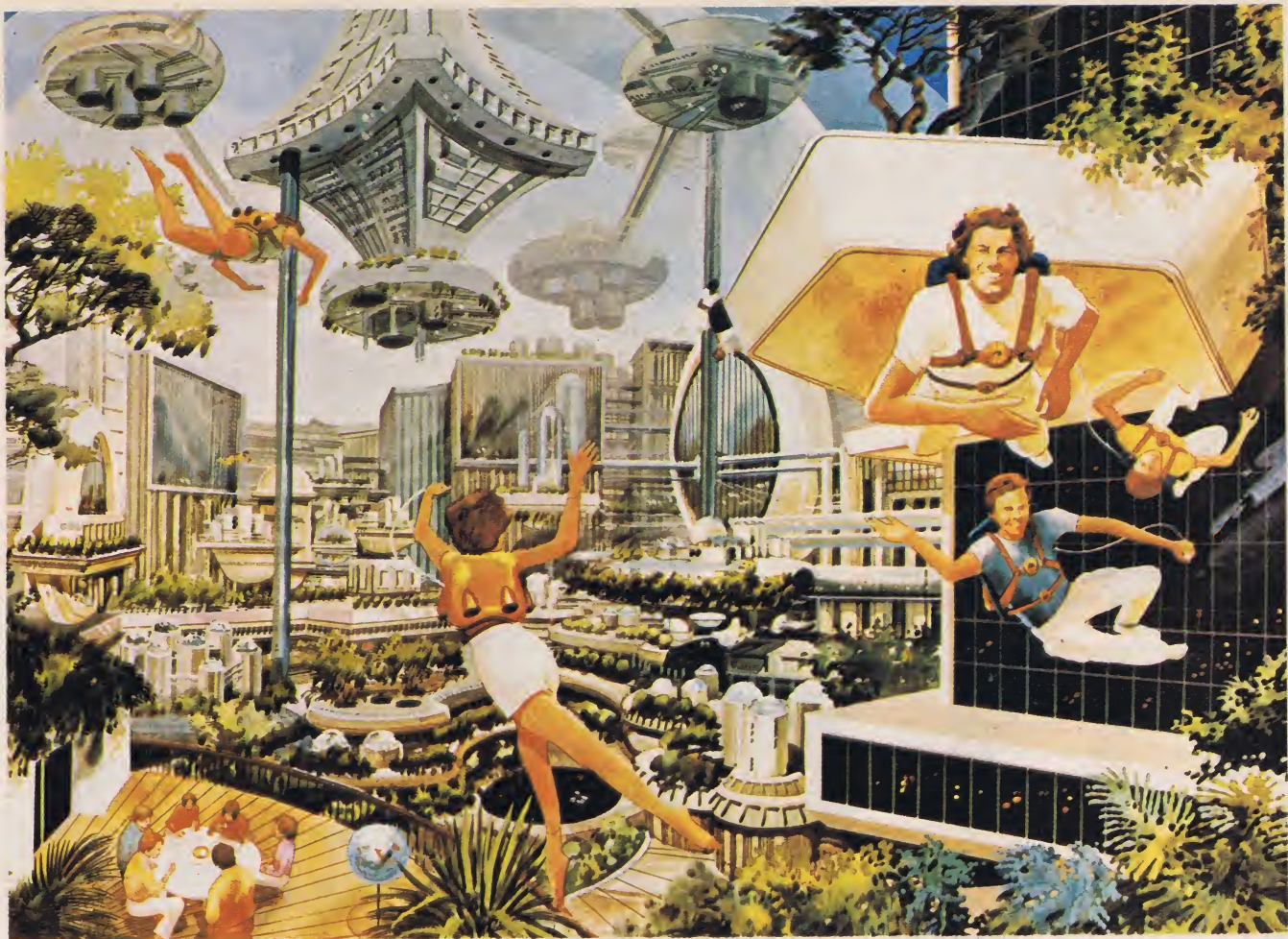
As the program for building powersats expands, the need for new colonies will expand apace, and a solid understanding of how to provide for a space community will develop. There will be a large corporation in space, or perhaps several such corporations, which may actually be departments of Earthside governments. These corporations will run the space transport and the centers for space construction. In addition, their orbiting "Panama Canal Zone" colonies will provide homes for the people who live in space; and the corporate management will have reduced to standard practice the means for supplying these people with their needs, without recourse to large-scale transport from Earth. When a new space community is to be built on a section of agricultural land expanded, the board of directors can vote to have these things done under fixed-cost contract. It will be the same as the routine, standard way an airline orders new jet planes.

We may imagine that the corporation that produces and leases the powersats operates a

very profitable business on a steady, even financial keel. It has ample flow of cash, and a secure, constant income from its powersat operations. It is then that the corporation would seek to grow and expand by moving into related areas of endeavor. One alternative would be the real estate business.

There is no reason why real estate development in space should be all that different from its more traditional Earthside counterpart. On Earth, areas of land acquire value when people want it and are willing to bid for it, as at an auction. In space colonies, real estate will have the intrinsic value associated with the capital costs and the energy needed to produce it, but there can be as much of it as one wishes. Land in space colonies will be like autos or refrigerators, which are sold at fixed prices and produced to meet the demand.

The simplest act of space colonization would call for no new construction at all. It would simply involve a change of policy: Instead of the corporation owning the people's homes and renting them to its employees, the tenants would be granted the opportunity to acquire ownership and a clear title. For those who had been living in space the longest, their rent payments of past decades might simply be counted for bookkeeping purposes as mortgage payments; they could own their homes free and clear. Even the most recent newcomers could have their rental contracts converted into mortgages, and rental payments of past years could be counted as mortgage payments.



PAINTING BY RICK GUIDICE, FROM TOWARD DISTANT SUNS

Inside a large space colony, small rocket packs and gliders will make it possible for people to fly in the lower gravity areas.

Even so simple a change would mark the end of an era. No more would the space-dwellers be regarded as wards of an all-powerful government. No more would there be a central administration to take responsibility for all phases of people's lives. It would mark the end of space communities as company towns, as extensions of bureaucratic fiefdoms. It would mark the beginning of a true space economy, aimed not at serving the needs of Earth but rather at serving the people who live in space.

The end of universal government ownership would also mean the end of the policy of tight control over who could and could not live in space. No more would there be careful selection of applicants to fill those jobs and only those jobs that the government deemed worth providing. No more would an employee have to leave the colony if he quit his job or was fired. Instead, there would be opportunities for people to make a living by private employment, providing new goods or services. An Earthsider, long attracted to space, could arrange to buy the home of a retiring space colonist and move there. With a loan from the Bank of the Colony, such a newcomer could work to set up his business, hoping his fortunes would prosper. Home remodelers, builders, general contractors would all be newly welcome in space.

There would be need for caution here. A too-rapid changeover to private ownership

could spark a speculative real estate boom. One can well imagine that the mid-21st century will see numerous millionaire space enthusiasts who have whetted their appetites with visits to the space hotel but whose real wish is to live there permanently. In a few days or weeks they might bid the prices of space homes up into the millions as they competed for the few thousand or so newly available properties. Many a colonist would find himself rich overnight, at least on paper, as his modest \$50,000 home or condominium happened to catch the fancy of some wealthy Earthsider. By selling, he would realize a quick financial killing; but the space activities would be deprived of his skills as he left for Earth with his money. In the span of a few months the space colony could change its character completely, from a home for valued employees to a center for frenzied real estate speculation. The eventual bursting of this financial bubble then would prove most unpleasant to all concerned.

So it would be important that from the start there be an adequate supply of real estate in space colonies. This would mean building more such colonies, whose land and homesites would be made available to Earthside buyers. There would be other land, too, for light industry and for shopping malls. The day of the company store or commissary would be at an end.

At a minimum, such "for-sale" colonies

would be built as a pressure shell of strong metal, with mirrors and window areas to let in sunlight. They would have coverings of lunar soil for radiation shielding, interior atmospheres, more soil on the inside. They would also have equipment for circulating electricity, air, and water while keeping the latter two fit for human use. The interior layouts of such colonies would vary. For those intended as farmland, there would be little more than flat soil. At the other extreme, luxurious colonies for those with expensive tastes (and wallets) would offer lakes and streams, marinas, golf courses, elaborate recreational areas, and even equestrian trails. Most likely the land would be sold in a condition ready for development, but without pre-existing buildings or other structures. It would be the responsibility of the buyers, whether as private individuals or commercial firms, to hire contractors to put up their homes and businesses. The colony government would still have its hand in this, but it no longer would be an all-controlling power. Instead, it would be like a real estate developer who seeks to encourage buyers who will contribute to the growth of the community.

Apart from the glamour of living in space and being a part of humanity's reach outward, there would be an eminently practical reason for Earthsiders (especially those from Chicago or the northeast) to prefer life in a space colony. A colony could easily be made

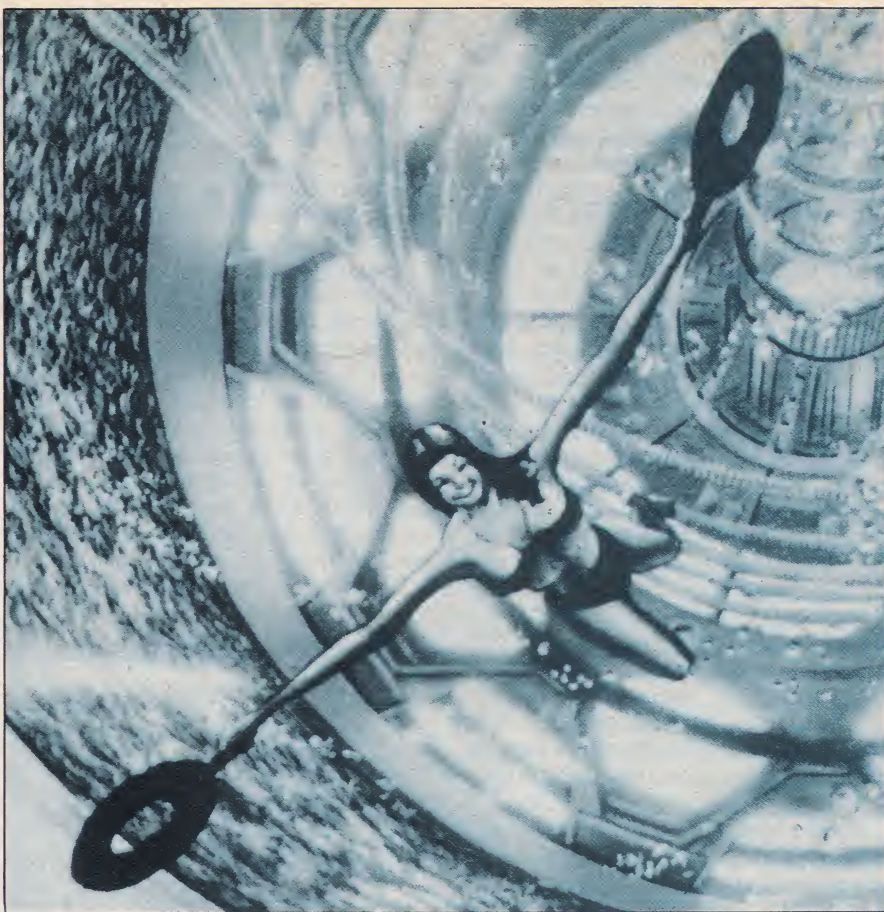
to have the best climate available, milder than Hawaii or southern California, entirely free from storms or other surprises, never ceasing to be warm and bright. The weather, of course, would be fully controlled. Nor need the scenery appear unnatural, artificial. If demand booms, it will be quite possible to build colonies that are miles in extent, with a blue sky and clouds, and with room for a million or more. If so few as a million Earthsiders were to take out mortgages averaging \$100,000—the price of a home and lot today in many desirable parts of southern California—that would be \$100 billion. That would provide for quite a bit of space construction.

In 1975, the artist Don Davis prepared a set of color paintings showing visions of the interiors of the largest possible space colonies. He showed parklands and green forests, rivers and hilly uplands, even a bay full of small boats and spanned by a large suspension bridge. Such ideas may appear to be mere fantasy, but they are no such thing. They will be entirely necessary if space colonies are to build a reputation for quality and desirability.

Perhaps the activity most resembling this kind of space colonization today is the building of new communities in the deserts of the southwest U.S. Several such developments have been built by a subsidiary of McCulloch Oil Corporation, which, like our fictional powersat firm, is a successful energy corporation that has diversified into real estate. The subsidiary, McCulloch Properties, has built such towns as Lake Havasu City and Fountain Hills, Arizona; Spring Creek, Nevada and Silver Lakes, California. Over the wasted deserts where 20-mule teams once hauled borax from Death Valley, there now rise attractive and much-sought new communities. Lake Havasu City is particularly well known; it is there that McCulloch rebuilt London Bridge, having shipped it from England. It is enough to make one wonder; surely the Golden Gate Bridge cannot forever meet the needs of San Francisco. Will it one day be dismantled and rebuilt in a future Lake Havasu City in orbit?

If a space community follows the pattern of the McCulloch developments, its amenities will be lavish indeed. For starters, there will be lakes well stocked with trout and coho salmon. Around the lakes will be boat docks and launching ramps, sandy beaches, barbecue pits, and grassy park areas. Many families will enjoy access to the lakes from their own backyards. Because the landscaping can be in whatever way the developers want, it will be easy to design a lakefront community as a number of long, low, sandy peninsulas extending into the lake. Each peninsula will be wide enough for a road down its length, with lots on either side backing against the water. Brightly colored sailing craft, or catamarans with aluminum hulls, will be just part of the local scenery.

There will be plenty for the sports-minded. It will not be hard to bring in championship tennis and golf pros to manage these sports activities and to arrange special events or tournaments. A professionally designed and landscaped series of golf courses will permit



Another zero-g sport: swimming in a barrel-shaped pool—both in and out of the water.

9-, 18- or 27-hole play, regular or championship. The ready control over landscaping will mean a challenging layout for every shot. For those who are not so proficient, a large putting green and driving range will permit people to sharpen their game. The game of golf will actually be more challenging in a space colony because the gravity will be artificial. Since it will be provided by rotating the colony, there will be an effect due to the rotation known as the Coriolis force. It will cause golf balls to slice to left or right even if hit straight down the fairway, and even the most proficient of golfers will virtually have to relearn the game to correct for this.

Every golf course must have a clubhouse, and this one will be no exception. Perhaps it will be a two-story structure on a rise of land, with excellent views of the colony interior. There will be a cocktail lounge and an excellent restaurant, a main lounge with a high cathedral ceiling and lavish floor space, a fully equipped recreation room with gymnasium facilities, locker rooms, bowling, saunas and massage rooms and whirlpool baths, as well as meeting rooms and movie theaters. Just outside the club house will be the basketball, handball and tennis courts as well as the swimming pools: an Olympic pool with three levels of diving, a Jacuzzi, a small pool for children, all with wide concrete decks and ample beach chairs, with a snack bar to complete everyone's enjoyment.

Elsewhere will be a hotel with convention facilities, riding trails and stables for horses, and bicycle paths. These may be in a separate

equestrian park. And all these facilities can be provided with no user's fees charged to the community residents or to their guests.

When building on a lot, the homeowner will have a choice of architectural designs, which permit easy construction with the aid of robots. A builder may control a team of robots as through he were Pharaoh driving a gang of slaves in a Cecil B. DeMille movie. This method will likely mean one of a couple dozen standard home layouts, available in different colors or styles of exterior trim, built from factory-manufactured modules. Custom-built homes will cost more. Construction will be straightforward and building codes simple, for there will be no storms or ice, no natural hazards, not even groundwater to leak through a foundation.

Yet if these colonies are to prosper, it will not be enough to establish them as resorts or real estate developments. Their success will call for much more than wealthy or independent space buffs buying homes there for reason of their novelty. Indeed, it would prove a very bad mistake to promote space colonies simply for reasons of fashion, for fashions change all too quickly. Biarritz may have been *tres chic* last year, but this year no one would be caught dead there, dahling.

Fortunately, there appear to be at least two industries that can supply the economic underpinnings for these orbiting cities. One of these would be the design and building of spacecraft. The powersat will be only the first of these. Just as the settlers of New England took advantage of their forests to develop

PAINTING BY DON DIXON: FROM TOWARD DISTANT SUNS

Boston and New Bedford as important centers for shipbuilding, space colonies will be advantageously placed to build spaceships.

By developing skills as instrument makers, propulsion specialists and electronics designers, the space colonies increasingly will be able to compete with the Earthside centers for spacecraft development. Among the people who will go there to live may be many astronomers and other scientists. Great observatories and physics laboratories can grow there to take advantage of the vacuum of space and the unimpeded views of the stars.

The second major industry would be information. In the next century many people will spend much of their working day at computer consoles or telecommunications terminals and will be free to live anywhere they please. The use of communications satellites will allow them to do their work and keep in touch with colleagues and associates without having to leave their offices. If such people are attracted to life in the space colonies, it may be less for the golf course or even the zero-g sex as for the superb, unequalled communications facilities they may command. Consultants, writers, analysts, financial managers—these may be only a few of the people, many of them self-employed, who will be able to make their livings in the space communities.

These communities can help facilitate the classic dream of astronauts setting off for distant planets on missions of exploration. This is a dream inspired by the historic voyages of Columbus, Drake, Hudson and Cook. It expresses the hope that as the ship with sails set was the very symbol of the Age of Discovery, so might the rocket, outward bound, serve as the harbinger of a new Renaissance.

The present era and the decades ahead are proving indeed to be a great age of space exploration, but the explorers are instruments and robots, not men. The people will follow in their wake, but initially there will be little of the grand romance of an *H.M.S. Endeavor* or *Golden Hinde*. Space exploration has much more in common with exploring the Antarctic than with the voyages of Columbus, and one does not venture to Antarctica in crude wooden caravels manned by illiterate sailors from the docks of Cadiz. But for good scientific or economic reasons, we will place large parties in McMurdo Sound or Prudhoe Bay. The same will be true when we send groups of people into the space beyond the Moon.

It was oil, ten billion barrels of it, which brought people to Prudhoe Bay. The space activities of the future will not seek this resource, but they will rely on what to them will be as valuable: water, carbon, nitrogen. With these it will be possible to go beyond the building of structures merely of metal and silicon. There will be new structural materials, stronger and with superior properties. There will be the opportunity for space agriculture. Above all, a ready source of these prizes will point toward the end of dependence upon Earth for a space project's most vital needs. It will become possible to think in terms of a civilization in space.

The prospecting for resources will take

place first on the Moon, then among the Apollo and Amor asteroids. Most asteroids are found in the belt between Mars and Jupiter, but a few venture closer in to the sun. The Apollos cross the orbit of Earth, the Amors pass just outside Earth's orbit. Astronomers estimate that there are 500 to 1000 such bodies larger than a kilometer in diameter, rich sources of materials.

In an era of concern over resource limits, it is comforting to know that the potential of the Apollos and Amors is not small. If these are regarded as fisheries whose stock is continually replenished, then on the average there are 400,000 tons of new Apollo/Amor asteroids introduced per year. If the Apollos/Amors are seen as a resource to be mined, they could supply a million tons per year for something like ten million years. It should be a long time before there is an Apollo/Amor shortage.

With the tapping of resources from the Moon and asteroids, the last requirement will

Space communities
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same reason other
civilizations have
grown. . . abundant
energy, rich resources
and talented and
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opportunities. . .

be met for a long-term growth of the space colonies or communities. When these communities are built and settled, the human presence in space will be well on the way to expanding beyond the early beachheads won by the builders of power satellites. Yet in a sense this phenomenon will not be new, but something quite old. The first settlers in Virginia came to grow tobacco to send to the mother country; how much of the production of today's America finds its way to England? San Francisco was founded as a seaport, a center for shipping; yet today in the Bay Area one of the most important industries is electronics, and many people there have never set foot on a ship.

The space communities will grow for the same reason other civilizations have grown. They will have abundant sunlight and solar energy, rich resources from the Moon and asteroids, talented and creative minds to seek new opportunities. Like pioneers settling a fertile and well-watered valley, the settlers in space will be able to see the fruits of their ef-

forts. Here will be no outcasts, sent to work a stony soil and to wrest a living from unfavorable lands. Here instead will be a youthful, energetic people, confident in the assurance that their efforts will prosper.


The space immigrants will come from many nations. When the colonization of space is thrown open to all, there will be no restriction as to nationalities. It will once again be the opening of the American West, with diverse peoples coming to win a new land. Even at the early stages of the enterprise, there will be need for a colony government. As the population grows, and as the space economy becomes more and more self-sufficient, the human presence in space will become less and less that of a colony, a mere appendage of the mother planet. Increasingly, the space-dwellers' government will assert itself in the councils of the world, speak for its own interests. Slowly, gradually, the space colony will evolve into a nation.

It will be a new type of nation. The newly arrived residents will not be like settlers on the western frontier; rather, they will be like homeowners moving into a new suburban subdivision. Nor will residence in space long remain a matter of golf courses and sports facilities. As with new communities in the desert, these amenities will give the space enterprise a reputation for quality, but there will then be the opportunity to construct much less lavishly appointed developments offering lower price tags to buyers. And this too will not be new. The first autos were expensive, affordable only by the wealthy, but they provided manufacturers with the experience which soon allowed Henry Ford to sell the Model T to Everyman. Airline tickets were for many years quite costly, but once the airlines had grown sufficiently, they were able to offer discount fares for all.

It is in this fashion that the human presence in space will grow. Yet that will not be the end of the story, but merely a new beginning. The influence on human thought will be profound. As the prospects of America embodied all the hope and optimism of 19th century thought, so may the new and vastly larger frontier create new hope in the next century.

The people of space will not be demigods, nor will they be sybarites and hedonists. Rather, theirs will be no more than the strengths and weaknesses of any other people. Their material prosperity will be remarkable, but in the long run they may be cherished more for the hope they will give humanity. The hope of new horizons, of new opportunities, of a better life in a new land. All this will be real, it will be possible, it will exist—it will be theirs.

And the frontier will stretch ever outward. Inevitably the colonists' thoughts will be drawn to the stars. The space dwellers will not be left in ease and luxury, for to them will fall the great but unaddressed human challenge. It will be they who will grapple with the unanswered question: In the vast Milky Way galaxy, in the cosmos of which it is a part, what is the significance of humanity?

This is the challenge of the stars, and this is the question that will lie before them. 

Choosing The Right Partner For The Future

One evening a consultant who was helping my husband and I prepare a technical paper on space farming suddenly asked me, "You and your husband both want to move into space, don't you?"

"That was one of the first things we checked when we were dating," I replied.

"You're lucky," he sighed. "My wife would leave me if I got a job in space."

No, Keith and I are *not* lucky. We're smart. We weren't dumb enough to get married just because our hearts went pit-a-pat and bells chimed in our ears. (People who are slaves to their gonads get what they deserve.)

So what is it you want out of the opposite sex that you can't get from a copy of *Playboy* or *Playgirl* and a little privacy?

I'll tell you what Keith and I get out of each other. We're partners. Partners in raising three smart, loving, helpful and loyal kids. Partners in Analog Precision, Inc., the electronics company we founded with a \$500 Mastercharge card and nerve and hard work. Partners in getting the L-5 Society off the ground, which, if you will forgive the boasting, is the foremost world organization promoting the colonization of space.

If you, too, plan to pioneer space, you will need a partner. And if your spouse and children aren't on your side, you're in trouble.

Why do you need a partner? A partner will risk his life to save you from an asteroid mining accident. A partner will stay up with you all night working by your side to meet that crucial deadline, even though she's eight months pregnant and running a fever. Your kids are partners if, when both your arms are in casts, they clean the house, run laundry and cook the meals—and they're only six and eight years old. Your husband is your partner when you're 12 hours from the nearest doctor, and you just had a baby, and something went wrong. You're hemorrhaging like a faucet was turned on, but he calmly massages your tummy, telling you jokes. The blood stops gushing, and you relax and doze off.

Hours later you wake and feel the new baby snuggling by your side. Your husband is still massaging your belly. "It starts bleeding whenever I stop," he explains. "I'm going to keep this up as long as you need it. I'm not going to let you lose any more blood." He stays at your side for 24 hours before deciding you're okay. Then he collapses and sleeps a long time. Two days later you're working side by side again.

That is real love. It's the stuff born of the sharing of danger, the challenge of adventure, of guts and sweat. The frontier has always been settled by the families who will toil for and defend each other.

So don't you *dare* marry someone just

because you like the same restaurants and have compatible tennis serves!

How do you find and win the love of someone who will become a true marriage *partner*? First, make certain you share the same goals. People who plan to pioneer space are a special breed. You can meet these people at space oriented meetings such as the Careers in Space conference, to be held in San Francisco in the last week of June, 1980. (See page 18 for further news on this conference). Men usually outnumber the women at these events, so if you want to catch a brilliant, ambitious and space-oriented husband you'll have the time of your life.


Check out your potential spouse's taste in books, because that's a quick way to uncover the bedrock of his/her ideals. My friend Jim, who is actively hunting for a wife, tells me he wants a woman who reads Robert Heinlein's epics of loyalty and courage.

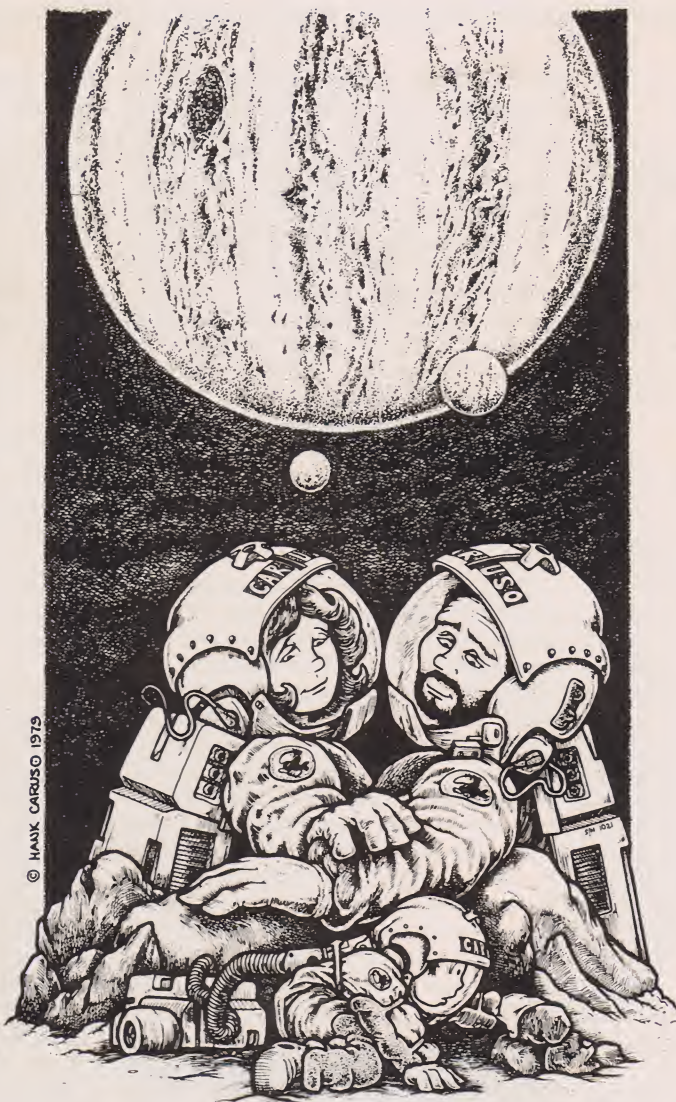
Where can you pick up a Heinlein fan? Try just about any science fiction convention. The caviar of 1980 SF "cons" will be the World Science Fiction Convention in Boston next Labor Day weekend. (For details, write Box 46, MIT Branch Post Office, Cambridge, MA 02139.)

Unfortunately for those of you with bristly faces, females will again be in the minority. Women—when will you learn? Bos-

ton on Labor Day 1980 will be crowded with the kind of men who will prove themselves heroes when the going gets tough. And they're looking for you!

Why am I anxious for you future space pioneers to build self-reliant, hard working families? Because us pioneers will need good neighbors. The kind of people you can rely upon to act quickly when a meteorite punctures a window. The kind of people who, when you and your mate "buy the territory" in a mining accident, will take in your orphaned kids and raise them as if they were their own.

The frontier is not always gentle. We'll need each other out there. 



Carolyn Henson is a founder and President of the L-5 Society, a non-profit organization dedicated to making space colonies a reality in our lifetime.

SCIENCE FICTION + ROCK = VIDEO

A group of musicians tries to launch the world's first spacey rock opera for video.

By ED NAHA

With the advent of video disc now at hand and the burgeoning worldwide popularity of video cassette systems, it looks like the 1980s will be a decade brimming with video software. Out to advance the cause of the video revolution is a group of San Francisco-based artists, writers and musicians who, within the next 12 months, will attempt to market the world's first futuristic video rock opera.

The creative congregation, led by writer Bob Heyman and former Jefferson Starship lead singer/songwriter Marty Balin, is working to bring the public a production entitled *The Planet of the Enchained Guitarists*, a tongue-in-cheek look at both science fiction clichés and rock and roll fads and trends.

Designed as both a video presentation and a long playing album, *Planet* showcases the evil concocted by a Ming the Merciless-type tyrant who rules a distant world run on disco power. Each day, he traps some of the universe's most brilliant rock guitarists and, bringing them to his planet, enters them in a gladiator-like battle of the bands held in a national broadcasting arena. The citizens of the planet vote for their choice via two-way TV system. The losing guitarists are sent to the music mines where hapless musicians are chained (*a la* the galley scenes in *Ben Hur*) and forced to play the droning disco power chords needed to power the crystalline cities

on the planet's surface. Eventually, one of the universe's primo rock guitarists is captured. He's not about to play that disco stuff for anybody. He falls in league with a heavy metal musical underground; a movement dedicated to the forces of good which, in this film, translate into good old rock'n'roll.

"We're currently in production on the video end of things," says Heyman, who has authored both the treatment and the script for the video film. "We've got three of the 12 original songs down on videotape. Our intent is to release the videotape and an LP or EP (extended player) simultaneously. *Planet of the Enchained Guitarists* will essentially be the first rock and roll movie made expressly for video distribution, either cassette, disc or cable, and record distribution at the same time."

The off-the-wall drama started quite innocently enough a few years ago. "I did a promotional film for the band Journey," says Heyman. "It was used to plug their song 'Spaceman.' We did an entire film using outer space footage. The band couldn't perform the film live because of personnel changes, so we created a visual story around their song. We looked at the finished film and found that rock and roll and science fiction were very compatible visually. The finished film actually made the song seem stronger than traditional concert footage would have. In an adjoining editing room I met Marty Balin who was working on a promotional tape with space footage in it for the Jefferson Starship.

"We got to talking about science fiction

and rock and roll and we decided to sit down and write a rock opera for video disc. We started out writing the science fiction piece but we got sidetracked and wrote a rock business spoof instead. We finished it, got it optioned as a movie, and then began *Planet of the Enchained Guitarists*.

"We immediately contacted Mike Varney, a local New Wave celebrity who was in a group called the Nuns. We knew he could write strong songs. We decided to make our video opera an almost Kiss-like spoof; a vehicle that would give a band of sophisticated musicians a chance to carry on in way out, science fiction costumes and then take the makeup off and play totally straight. Marty, Mike and I put together a band called Cinema which features Mike. We look to Cinema as a continuing element in our upcoming plot-rock video projects. Mike wrote the songs for *Guitarists*. I wrote the story. Marty, right now, is sort of our creative leader. A producer. He's handling the publishing of the songs and the management of the band. In a way, it's his name that opens doors for us."

With the concept in their heads and the story down on paper, the trio approached West Coast illustrator Les Space to execute a story board depicting key scenes from the video opera. At this point, both the songs and the illustrations are being shown to record companies. Some of the money invested in the proposed long player will find its way to the video end of the project. While no definite commitment has been made by any labels as yet, the group has high hopes that the finished *Planet of the Enchained Guitarists* will be hitting the stores by the end of 1980.

Heyman believes that the production will have something to intrigue everybody. Rock music for the rock mavens. Strange video effects for cassette fanatics. There might even be a few wrinkles added to please old Jefferson Starship fans, too. "Marty will probably narrate the finished film," says Bob. "He wants to play the evil disco czar, too. But," he adds with a chuckle, "in our first rock opera, he wanted to play the classic statue of justice holding the scales in drag. At this point, I suppose you could refer to Marty like a friend of mine in the computer business does. We don't try to explain him. We just say he's an ambulatory random variable."

And, if *Planet of the Enchained Guitarists* clicks in the video business, Balin and his fellow variables will be treating the eyes and ears to spacey imagery for years to come. □



Michael Varney as guitar hero, spacey V-man.



Jesse Bradman is an anti-disco rebel singer.

Right: A hasty approach towards the disco planet as painted by spacey Les Space.



Future Dreams On Public TV



Ursula K. Le Guin's *The Lathe of Heaven* is only the beginning of an ambitious experiment that will bring dramatic speculative fiction to the video airwaves.

By ED NAHA

George Orr has a slight problem. What ever he dreams becomes a reality. Under the tutelage of psychiatrist Dr. Haber, George is asked to use his dreams to make the world a better place to live in. Since his visions are capable of altering the world past, present and future, the task seems an easy one. At this point however, George Orr's slight problem becomes everyone's major problem. Dreaming, it seems, is tricky business. When Haber informs sleeping George that overpopulation isn't healthy for the world, a plague appears and kills millions. When Haber states that racism is bad, the citizens of Earth turn a uniform gray. When Haber asks his patient to stop the constant warring between nations, the globe's population is suddenly united in a common defense against an army of marauding alien creatures.

Clearly, world-shaping is not all it's cracked up to be.

George Orr's "problem" is the basis of Ur-

sula K. Le Guin's highly touted novel, *The Lathe of Heaven*. It is also the cornerstone of PBS' forthcoming video presentation of the same name; a two-part pilot episode for a proposed public television series devoted entirely to the best of the "speculative fiction" genre.

Starring Bruce Davison, Kevin Conway, Margaret Avery and Nikki Flacks, PBS's *Lathe of Heaven* is the brainchild of Executive Producer David Loxton, director of WNET/Thirteen's acclaimed Television Laboratory in New York. Together with coproducer and co-director Fred Barzyk, Loxton filmed *The Lathe of Heaven* on a budget of \$740,000 over a period of 12 months. The project's roots, however, can be traced back nearly a decade.

"I was working for what was then called National Educational Television in 1970," recalls Loxton from his WNET headquarters, "producing experimental and innovative drama. Like everyone else, I had

discovered Kurt Vonnegut in the 1960s. I was anxious to see if he would write something original for public television. He didn't have the time, so we came up with a sort of 'the world of Vonnegut' special; a combination of several of his short stories and snippets from his novels. He wrote the narrative structure for the show and it ended up being a 90-minute drama called *Between Time and Timbuktu*.

"The show made me realize that the kind of imaginative writing Vonnegut was doing was totally compatible with television. From that point onward, I wanted to launch a series which would present the works of the best speculative fiction writers. Unfortunately, at that time, there just wasn't the kind of money available in public television needed to support that kind of a series."

Loxton bided his time until the 1975-76 season when PBS's budgets began to grow. He brought his series idea to the powers-that-be, stressing the point that it would be



Above: Bruce Davison as dreamer George Orr is about to enter a medically supervised dreamland wherein dreams become reality. Opposite page: When George's mentor, Doctor Haber, attempts to rule the world via dream-power, he opens a Pandora's box of disaster.

devoted to "speculative fiction" as opposed to "science fiction."

"I use the term 'speculative fiction' to describe that branch of science fiction which places less emphasis on science and technology and more emphasis on human behavior and social evolution. Though often written in allegorical or metaphorical terms, the works provide clear insights into the moral and ethical questions facing mankind today. I also used the term 'speculative fiction' because we were trying to escape the negative attitude many people have towards 'science fiction.' Most people, I've found, don't read science fiction and when you mention the term you get a fairly simplistic, negative response. What I wanted to do with this series is present what I believe to be some of the best literature being written in America today—which happens to be set in the future. If you prefer a genre description, you could call it 'speculative.'

"Stressing that point, I received some money to explore my premise. I had to come up with *one* novel that could be considered for the pilot. We knew from the outset that Ursula K. Le Guin was one of the finest novelists in this speculative area but it was impossible for us to consider something like the wonderful *The Left Hand of Darkness* because of budgetary restrictions. I knew

we'd never get the money needed to present something that ambitious. We read *The Lathe of Heaven* and thought it was perfect in terms of length and producibility."

At that point, Loxton approached Le Guin with the idea, albeit cautiously. "I had heard all sorts of stories about this reclusive, mysterious figure," he laughs. "So, I was pretty hesitant about meeting her. After a few letters and phone conversations, I finally visited her in Oregon in 1977. I chatted with Ursula and her husband about the series. She loved public television and she became excited about the prospects of the show. I hadn't told her what novel I was interested in at that point. I just told her our budget and our time limitations. We talked about some of her short stories. At last she said, 'You know, I think *Lathe of Heaven* would work.' I breathed a silent sigh of relief. 'That's funny,' I said, 'that's *exactly* what I was thinking.'"

With Le Guin's creative input at the helm, Loxton then hired a succession of writers to work on the difficult task of taking George Orr's dreamworld to the TV cameras. "It turned out to be a much harder book to dramatize than I anticipated," states Loxton. "Initially, I thought *Lathe* would be simpler than *The Left Hand of Darkness* because it had a much more straightforward story line.

But it really doesn't. As we got into it more, we found ourselves endlessly torn between being letter faithful to the book and taking off on our own."

After a few years of brainstorming, a finished script was produced. Necessary money was raised by PBS and a co-producer and a starting date of November 1978 was assigned. Then, without warning, the show ran into monumental budgetary problems. "In terms of actual dollars, we had about \$800,000 to work with," Loxton recounts, "\$400,000 per episode. That, in essence, is what a standard commercial TV action-adventure show, like *Charlie's Angels*, has to work with. Compare that to the one million dollars per episode used by shows like *Battlestar Galactica* and you can see how tight things were for us. We knew we had to be fairly inventive in getting this production going. We got three-fourths of the money needed from CPB and the remaining funds from a European co-producer. Everything was working nicely when our co-producer pulled out. We had two months to go before production and we were suddenly \$200,000 to \$300,000 short. We already had Bruce Davison signed and all our locations scouted and chosen. PBS gave me an additional few months to re-raise the money. They told me I could postpone production until March of 1979.

"With March now slated as our starting date, I was no longer sure that Bruce could appear. He had a fairly full schedule, and, although he loved the project, he couldn't actually commit to a March shooting. Luckily, I was able to get another co-producer who contributed \$200,000. Even with that, we had to pare down our budget a bit. But everything worked out. Bruce came through. We were able to get Kevin Conway for Dr. Haber. The money was there. We began filming on schedule."

Dreams To Reality

The filming of *Lathe of Heaven* in all its futuristic glory proved a monumental task on a number of levels for everyone involved, both behind and before the cameras. "The most difficult aspect of filming speculative fiction," Loxton points out, "is to create a viable future world. *Science fiction* is stylized to the point where you can get away with just about any illogical stuff. You accept clichés in science fiction.

"In speculative fiction, however, everything has got to make sense. You're dealing with myth and allegory and you have to present that within the context of a credible futuristic backdrop. In *Lathe*, you don't have just one world to create, but five or six. We had to deal with worlds of overpopulation, plague, alien presence, underpopulation and so on. George keeps creating new worlds on the ashes of the old."

In order to get the most futurism for their money, the cast and crew filmed on location in the Dallas-Fort Worth, Texas area which is, according to Loxton, "one of the most modern and futuristic areas in the nation." The surrealistic settings of Dallas' Hyatt Regency Hotel, Fort Worth's Tandy Center,

Dallas' City Hall and airport became, for the PBS cameras, the Portland, Oregon home of tomorrow's citizens, Orr and Haber.

For the actors, however, sliding into the future did not come as easily as it did for the camera's eye. "I think the characters and setting of *Lathe* presented a challenge for us all," says Kevin Conway, the film's bearded Dr. Haber. "*The Lathe of Heaven* isn't a show that fits any one label. It's not a com-

edy. It's not a drama. It's not science fiction. It's a presentation of vignettes that point out the consequences of the misuse of power. As a result, the futuristic characters had to be slightly exaggerated, yet believable.

"Haber, for instance, had to be portrayed slightly larger than life. He's a very frustrated man. Before George visits him, he is nothing. He has a decent job. He's a psychiatrist. But, in the future, psychiatrists are as common

and unromantic as Certified Public Accountants are today. They're all over the place. He's the last on the wall chart of 1,000 psychiatrists, sort of junior member. He's a proud man, and hence, very frustrated with his position.

"When George shows up, it's a godsend. Haber enjoys power. Through George, he can let his own imagination run wild and change the world. Haber's instincts, his intentions are good. He is not unlike many of the charismatic leaders of today who assume that their vision is purer than everyone else's. The tragedy of Haber is that, when he does get the power, when he actually does hook *himself* up to his dream augmentor device, he is found to be hollow. There's nothing inside of him to give. That realization burns out his brain. He is a total void. At this point, he loses control of his dreams and begins to cause the world to melt!"

Bruce Davison, who portrays the dream-laden George, is slightly more laconic about his role. "It was another one of my very strange film experiences," he smiles. "But I loved it. Ursula told me from the start, 'George isn't crazy. He just has this problem.' I thought, right, he's a normal everyday guy who changes the world everytime he dreams. Some problem."

"I imagine this show was really difficult for the directors," Conway adds. "They had to pull off the future in a realistic manner and make it identifiable. And, let's face it, some of the scenes they had to handle were pretty strange. I guess we all found it a little crazy.



Above: In the overcrowded world of the future, there simply isn't enough food to go around. The wretched citizens are forced to congregate at well-worn feeding centers. When George attempts to rid the Earth of such a dire condition, he inadvertently creates a plague which kills millions. Below: When Haber takes control of the dream augmentor, his essential hollowiness causes the world to begin to split at the seams.



"And crazy things always seemed to be happening. There is one instance in the film where we had to shoot a fight between Haber and George that takes place within a spiraling laser beam cone of light. We filmed it in a studio. Now, I had never been next to a laser before. Everyone was really nervous. I asked this one technician, 'Is this scene dangerous?' The fellow thought a moment. 'No,' he told me. 'Just don't look directly into the beam. It will burn your corneas right out.' I was scared stiff, but imagine how the camera crew felt. They had to face the laser and film into it."

Yet another part of the show called for the population of the world to turn totally gray in color. "The worst," Conway states emphatically. "None of us knew what we were getting into with that section. We were painted with gray greasepaint. It came off on anything you touched. We felt like lepers during our five or six gray days."



Haber and George at the augmentor device.

"Truly weird," Davison echoes. "At one point, I had to be painted with gray from head to toe. It was awful. It was a mess. Everyone was gray and felt miserable. We shot at the Hyatt Regency and there were all these conventioners there who were getting up in the morning with terrific hangovers. They'd walk into the lobby and see 200 gray people in strange costumes milling about. I'm pretty sure we flipped a lot of them out. You know, you'd hear dozens of guys say 'I'll be in the bar' simultaneously."

The show's futuristic trappings did have their positive points, according to Conway. "For an actor, it was a wonderfully free-wheeling experience. Total imagination was required. During one scene, for instance, George is lying down with the machine attached to his head and I'm sitting across the room at my desk. Usually, Haber is right next to George and puts him to sleep by pressing a finger to George's neck. Now, the way the scene was set up, it would have been awkward for me to dash across the room to put George to sleep. Bruce was staring at me at the desk. I raised my finger and winked, 'Oh George, a new wrinkle.' I pushed my index finger down on the desk top. Bruce understood immedi-

ately. He went out like a light."

While most of LeGuin's prose translated dramatically, if not easily, to the screen, some of the book's plot twists posed fairly unique problems. "We were petrified about filming the aliens," producer Loxton admits. "Visually, it could suspend viewer belief in the production. To make matters worse, in the middle of our pre-production period, when we were saying that this production isn't going to have rocket ships, ray guns and intergalactic conflicts, *Star Wars* and *Close Encounters* came out. Suddenly the whole world went special effects crazy and we're sitting there not capable of competing with *Galactica*'s \$2,000 per second. So, we decided not to compete."

Actor Conway concedes that there wasn't much intergalactic competition on the *Lathe* set. "We almost wept when we first saw our 'alien,'" he chuckles. "He looked like the



Haber and George in a world without racial prejudice. Everyone has turned gray.

Michelin tire man; this big, huge, round rubber guy. The actor inside had to be lowered into the suit with a block and tackle. He couldn't really move. They filmed him very subtly and, thank god, he looks great on the screen. But one should remember that the aliens are a creation of George's and are, logically enough, pretty happy-go-lucky creatures. *Star Wars* they aren't."

Despite *Lathe*'s gray-skinned citizens, real-life dreams and alien foils, everyone concerned with the film believes that the production will impress audiences with its contemporary feel. "The show is merely an exaggeration of today," Conway offers. "The problems, the attitudes, even the clothes are exaggerations of today. It has a message, I suppose, in terms of the battle between arrogance and power, but the film is more like a mirror than a monologue. It shows you things. It doesn't preach."

"George's world is just one step beyond today's," nods Davison. "The show is just beyond today's crises. It deals with choices that have to be made now. Yet, it's optimistic. George keeps on dreaming. He doesn't run out to the end of his rope, despite the fact that he's faced with some pretty dire straits. When

he first wakes up, the world is in a pea soup of pollution. Tomorrow, right? Well, we're not really far off from that now. There's smog in the air. There's oil in the gulf. Now's the time to start dreaming."

The Morning After

"What we tried to do," says Hugo Award winning author Ursula K. Le Guin, "is put a book onto the screen. I think we've done that." Working on a new novel in her Oregon home, the world-renowned writer reflects on her first experience with television. "I'm really happy with the finished movie. I loved it. I've been in on this right from the start and, believe me, it was difficult to reconceive the entire story visually."

"You see, the book, in a way, takes place in George's head. We tried to suggest psychological tension in the show, we tried for poetic images. We're not trying to compete with

Star Wars and show you everything on the screen. We're trying to make the viewer imagine a lot of things. We're trying to get you to fill in the blanks. We use dream-like narrative. We repeat certain images. We tried to visually create a book."

Le Guin, a fairly outspoken critic when it comes to inferior screen science fiction, believes that *The Lathe of Heaven* will transcend all genre labels. "What makes this different than most science fiction presentations," she says, "is the strength of its characters, particularly George and Haber. What happens between those two men is marvelous to watch. I think the show will appeal to people like any good drama would. I hope people will appreciate the intensity of the plot."

"People shouldn't tune in expecting outer space because they're going to get inner space. You're not going to see Lorne Greene on the screen in a cape. This will disappoint some people and please others. But that's how it is, dealing with what people call 'science fiction.' Science fiction on film is way behind science fiction in books. It's been 30 or 40 years since SF readers were interested in

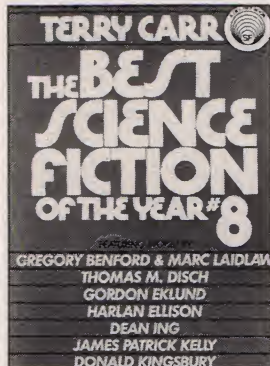
(continued on page 57)

Science Fiction Bests—Present and Past

Best

Last year witnessed the biggest boom in science fiction's history. SF books sold better than ever and, suddenly, SF writers began receiving the kind of money they had always dreamed about. This new-found prosperity is causing some changes in the genre.

Traditionally, science fiction writers have tried out their new ideas in the pulps, in short stories. But now, with the promise of more money and time, established writers are trying out their new ideas in book proposals. This trend has the magazine and original short story anthology editors scrambling through their slush piles in search of new talent.



Terry Carr sums up last year's trials and triumphs in *The Best Science Fiction of the Year #8* (\$2.25 in paperback from Ballantine/Del Rey) and he's found some new discoveries who are writing great

stuff. One new name is Hilbert Schenk, whose story "The Morphology of the Kirkham Wreck" puts a new twist on time. His characters bend time instead of traveling through it, which produces an adventure story with a surprising new feel. "Death Therapy" is one of James Patrick Kelly's first sales and it bodes well for his future. With sharp characterization and a tough story line he describes a frightening new capital punishment—you kill your prisoner, then bring him back and let him go.

Two of the new talents are actually rediscoveries. Dean Ing and Donald Kingsbury both tried their hands at writing SF in the '50s, gave it up and have recently returned to good effect. Kingsbury's offering is "To Bring in the Steel," an effective tale of asteroid mining that is a classic engineer adventure with its consciousness raised just a little. In "Devil You Don't Know," Ing puts a genius hydrocephalic dwarf and an HEW investigator together to investigate today's snake pits—state mental hospitals—and in this case they come away with more than they ever wanted to find.

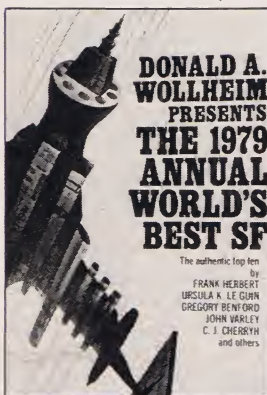
This abundance of relative unknowns shouldn't make you think that SF's best writers have abandoned the short story. Thomas Disch, one of the genre's premier stylists, returned last year after a long absence with "The Man Who Had No Idea," a tale of

a young man trying to get a license to speak in public. It may not be subtle, but it's very funny. Nebula Award winner John Varley makes an appearance with his own version of the SF whodunit, "The Barbi Doll Murders," and, in his own inimitable fashion, answers the question, if everybody looks exactly alike how do you find the guilty party? The collection also includes stories by notable science fiction celebrities.

More Best

SF fans are an argumentative lot. Just as they can't be satisfied with one annual awards orgy (the writers have one and the fans have several), there are at least three editors who feel compelled to share with us their best-of-the-year choices. Donald A. Wollheim's collection, *The 1979 Annual World's Best SF* (\$2.25 in paperback from Daw Books), is subtitled "the authentic top ten," and with more than three decades of science fiction editing experience, Wollheim may be the most qualified man for the job.

His authentic top ten, however, is heavy on lesser efforts by established authors. Frank Herbert and F.M. Busby contribute "Come to the Party," a joint effort that tells another story of ecological wrong-headedness that is definitely less than the best either of them can offer on their own. Ursula K. Le Guin chronicles an end of the world multiple-choice test in "SQ" (sanity quotient), and James Tiptree, Jr. (a.k.a. Alice Sheldon) contributes an uncomfortable, bathetic story titled "We Who Stole the Dream," wherein a timid race



of aliens fleeing the tyrannical Earthers to their home system find their own people to be just as tyrannical and cruel. The Daw collection is rescued by three stories: John Varley's Nebula Award-winning "Persistence of Vision," Greg Bear's "Scattershot" and Gregory Benford's "In Alien Flesh." These three stories are, by themselves, worth the price of admission.

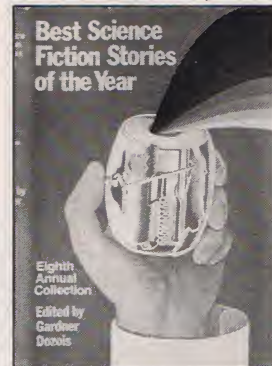
"Persistence of Vision" defies summary and one can only recommend that if you're interested in the very best SF can offer, get this story in any one of the collections that feature it. Greg Bear is one of the newcomers and his "Scattergun" plays delicious tricks

with space, time and scenery. He creates an immense ship made up of ships hurled together by countless universes' wars. And when the crews from different times and spaces try to help each other home, it's a trip not to be missed. Gregory Benford's hero takes a trip literally "In Alien Flesh" to tap a whale-sized alien's brain...and wishes that he had missed the boat, because he gets hooked on the feeling.

Wollheim and his co-editor Arthur Saha also include solid stories by C. J. Cherryh, Jack Chalker and others.

Best Best

Gardner Dozois tells his version of last year in *Best Science Fiction of the Year, Eighth Annual Collection* (\$9.95 in hardcover from E. P. Dutton).



Dozois introduces the collection with a long gossipy summary of the state of the art, his opinions of same and news of who's where and doing what. Then he begins his anthology appropriately

with Varley's "Persistence of Vision."

This terrific opening is undercut by the three weak stories that follow, but if you can wade through an Asimov toss-off, Christopher Priest's "Whores," an attractive but ultimately empty story, then skip Bernard Dietzman's tale of Stone Age savagery entitled "Cousins," you'll come to your reward: Dozois has collected the best stories from both the other collections and added a few surprises of his own.

From Joan Vinge you'll find "View from a Height," the diary of Earth's first interplanetary exile, an evocative story about a very special woman. Thomas Disch presents future love, obsession and a new way of death in "Mutability." Michael Bishop files one of his future documentaries about dome city dwellers called "Old Folks at Home," proposing a new way to make your later years really golden. James P. Girard's "September Song" follows a time-tripping assassin as he uses the Top 40 on the car radio to cruise through the years, and Gene Wolf's "Seven American Nights" is a shattering glimpse of the future U.S. by one of tomorrow's Arab tourists. This volume also includes Benford's "In Alien Flesh," and "Lost and Found," a quirky short about timehoppers by Phyllis

Eisenstein.

This is the strongest, most vital of the three collections and makes what all three editors have called one of the short story's weaker years seem not so bad after all.

All three collections manage to give you a taste of what next year's best books will be like. Since most of these folks already have a novel in the works, next year's collections will probably have a whole new set of unknown names.

Auto Anarchy

Even the most argumentative SF fans should be able to agree that *Car Sinister* (\$2.25 in paperback from Avon) is the ideal book to have along when you're stuck in a gas line. Editors Robert Silverberg, Martin Harry Greenberg and Joseph D. Olander have put together a collection of automotive speculation from the gas-rich '60s. Their choice of



killer Cadillacs, vampire sports cars, murderous smogs and high-way combat shows that, early on, SF's best writers glimpsed trouble on the horizon for the American dream machine.

The title tale, "Car Sinister"

by Gene Wolfe, offers a peculiar vision of auto erotica, redefining the old term "stud" car. Such lightheartedness is the exception in this dystopic volume. Roger Zelazny contributes two combat scenarios, "Devil Car" and "Auto-da-Fe," which pit man against machine on the road and in the bullring; these are more representative.

Combat on the road seems inevitable to these authors; they just can't agree who's going to be fighting where. Harlan Ellison thinks we'll be battling it out on the open road in rolling gunships, according to "Along the Scenic Route." Fritz Leiber disagrees, asserting that the next war will be between pedestrians and drivers in "X Marks the Ped-walk." The most frightening battle, though, is automotive overpopulation that may destroy the air, then the people. "A Plague of Cars" by Leonard Tushnet buries New York City under multi-level, multi-lane highways, and then Frank Herbert shows what happens to the drivers on those highways as they're pushed to ever higher speeds in "The Mary Celeste Move." This story is the collection's highlight, showing the breakdown of the one part the engineers can't redesign—the driver.

This book also includes stories by Barry Malzberg and Harry Harrison, but it doesn't contain any suggested solutions except R.A. Lafferty's wishful "Interurban Queen,"

which asserts that we never should have let the things on the road to begin with.

Briefs: Best Classics

One place where the world got ahead of SF is in matters sexual. In the '40s and '50s, our heroes were clean of mind, saving damsels in distress—and the universe—for no more than a kiss on the cheek. Philip Jose Farmer struck one of the first blows for freedom with *The Lovers* (\$8.95 in hardcover from Del Rey/Ballantine). When this story of human-alien love first appeared in 1952, it generated so much controversy that Farmer felt compelled to expand it to book length.

Now with several sorts of sexual revolution behind us, *The Lovers* can be read as a tale of love, death and first encounter—instead of just an iconoclastic exercise for shock effect.

Farmer's 31st century America is rigidly controlled by the Sturch—a combination of church and state with the most repressive characteristics of both. Here, everyone has a highly specialized job, a spouse and a personal guardian angel something like a live-in policeman/priest. Our hero, Hal Yarrow, doesn't like any of this and jumps at the first opportunity to escape it all—a trip to the distant planet of Ozagen.

A linguist, Yarrow is supposed to study the native Wogglebugs' language under the care and keeping of his guardian angel, Mr. Pornsen. But Yarrow encounters Jeanette, a fabulously feminine alien and, throwing off a lifetime's conditioning, dumps Pornsen, the Sturch and the whole expedition for love.

The sex here is so discreet that you wonder



how anyone could have been offended, even 20 years ago. This combination of foolish love, the strangest evolution on record and Farmer's fabulous style won him a Hugo as 1952's most promising young writer.

His subsequent body of work, including the best-selling Riverworld series, shows that the fans in those days knew what they were talking about. This is an important book in the history of SF and one that still holds up as an interesting and entertaining tale.

This Farmer reissue is part of a growing trend. Science fiction publishers are conserving their energy by recycling some of SF's greatest hits.

Heinlein's cult classic *Stranger in a Strange Land* (\$2.50 in paperback from Berkley) is only the first of a dozen of the master storyteller's books to be reissued with a series of

beautiful new covers. *Starship Troopers*, *Glory Road*, *Podkayne of Mars* and eight others are soon to follow this story of a child raised by Martians to be something other than human. Heinlein's paen to the entrepreneurial spirit, *The Man Who Sold the Moon* (\$1.95 in paperback from Signet), offers a blueprint for space capitalists—to do it right, do it big—and should be on every hopeful colonist's required reading list.

The Stars Are the Styx (\$2.25 in paperback from Dell) collects Theodore Sturgeon's stories from the halycon days of the '50s when he appeared in *Galaxy* so often that it seemed like he was on the staff. This book includes such hitherto uncollected gems as "Tandy's Story," a tale of children and change; "The Education of Drusilla Strange," one of Sturgeon's patented stran-




gers-among-us stories and ten other jewels that make up a collection that will intrigue and enchant. Also back in print is Sturgeon's classic novel, *More Than Human* (\$1.50 in paperback from Ballantine). This is

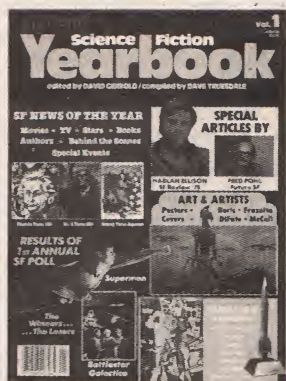
one book that is on everyone's required reading list, and if you haven't read this story about six social outcasts who, together, telepathically form the next step in human evolution, get it and enjoy. You're in for a treat.

James H. Schmitz is not a well-known name to many of the genre's new readers, but in the '60s he made a name for himself by being the first author to decide that women could have adventures, too. His best character was Telzey Amberdon, and *The Universe Against Her* (\$1.95 in paperback from Ace) was the first and best of several books to feature this young genius-telepath and her encounters with all manner of alien creatures and her own powers.

Jack Vance has been putting together incomparable alien vistas and tremendous technology for more than three decades and now he's put together a collection of the best of his own work and called it, not surprisingly, *The Best of Jack Vance* (\$2.25 in paperback from Pocket). It includes a space sailboat, a collection of unique extraterrestrials and a raft of great ideas. Vance is another craftsman who is too often overlooked.

These are only a few of the reissues hitting the stands, and you owe it to yourself to check out some of SF's earlier efforts because it was not always as it is today. The ideas of today's SF were developed a step at a time, and sometimes the first time was the best. 

LATEST!
STARLOG PRESS PRESENTS
THE SCIENCE FICTION
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The YEARBOOK is a historic volume that places all the science-fiction events of the year in your hands. Edited by well-known SF author David Gerrold, the YEARBOOK includes contributions from the editorial staff of STARLOG/FUTURE LIFE Magazines, as well as SF fans, pros and authorities around the world. The YEARBOOK is divided into 11 sections. The News section covers all aspects of the fields of SF literature, film, recording, TV, conventions, publications and special events. The Art and Artists section features outstanding book covers, posters, calendars, other SF graphic arts plus an exclusive SF painting in the center spread, commissioned especially for this volume. For many, the highlight will be the Awards section. Here the Nebula, Hugo and other winners of the year are announced. This section also reveals the results of the First Annual STARLOG SF poll.

The fan field is covered in depth in terms of conventions, outstanding personalities and unique projects.

The Perspectives section spotlights articles on current SF topics by three of the leading authors in the SF world.

In addition, the following sections will also be of major importance:

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Books in Brief

Juniper Time by Kate Wilhelm (\$10.95 in hardcover from Harper and Row). Kate Wilhelm takes conventional ideas and turns them into masterfully constructed, unconventional novels. *Juniper Time* takes three traditional science fiction concepts: ecological disaster, extraterrestrial communications and the construction of the first space station, and twists them into astonishingly imaginative shape.

Set in the not-too-distant future, *Juniper* is a humanistic tale which recounts the life of Jean Brighton, a highly talented woman in a world which regards educated females as objects of scorn and/or violence. Brighton and Arthur Cluny, the offspring of astronauts, face a truly foreboding futurescape. Drought has devastated the western United States and citizens are migrating eastward to settle in squalid concentration camps called Newtowns. Unexpected rain has turned China into a jungleland. Snow now falls in once-parched areas. The world is ravaged by a violent sense of desperation. And in space, orbiting silently, is a possible way out: the half-completed shell of a space station.

Suddenly, a message is found near the station. Is it from aliens? Is it a hoax? Linguist Brighton and pro-spacer Cluny find themselves caught up in a web of emotional and political conflict that takes them through both the inner workings of government espionage movements and the last vestiges of a decaying American Indian civilization. Wilhelm weaves these far-flung concepts together so meticulously that the reader never truly realizes how diverse these elements are.

(Charles Bogle)

Never Say Die: An Autonecrogographical Novel by Robert Grossbach (\$8.95 in hardcover from Harper and Row). According to writer Robert Grossbach, not only is there no dignity left in death, the afterlife isn't anything to write home to mother about, either. Crushed rather haphazardly by an ice cream truck outside of a White Castle burger haven, hero Jay Aurinson finds himself stuck in a lifestyle after death that has very little to do with traditional concepts of heaven and hell. Residing in Three Space (another Universe), Jay is ruled by the alien Stim (bagel-shaped life forms), and rubs elbows with the mysterious Creatures from Outer Space (all disguised as Hungarian building superintendents). With the help of the secret *Book of Bernard Jay* and a group of ex-lifers plan the ultimate prison escape. They attempt to return "from the dead" and make their way back to Earth where, hopefully, they can start life anew. The Stim, however, have other ideas and Grossbach's finely honed satire ends on a jarring albeit logical note. *Never Say Die* is a delightful read; a book that stimulates both the imagination and the intelligence. And it only hurts when you laugh.

(Ed Naha)

Nightwatch by Andrew M. Stephenson (\$1.95 in paperback by Dell). Almost every

popular topic in science fiction can be found in this interesting but ultimately unsatisfying novel: robots, Moon colonies, nuclear holocausts and alien encounters (in that order). Dan Frome, the rather reluctant hero of the piece, is an expert in robotics—has, in fact, designed a new, very personable type of self-programming robot called a golem. Along with an international group of scientists, he has been shipped to a Russian Moonbase under false pretenses in order to (a) intercept an approaching alien spaceship, and (b) become part of a core of humanity that will survive the impending nuclear war. Well, the war occurs on schedule, Frome takes part in some rather puzzling cloak-and-dagger scenarios and ends up in a hastily built spaceship run by his pet robot, Ishmael, on his way to encounter the aliens.

While Stephenson has created an interesting and likeable protagonist, he has tried to cram too much into the framework of a medium length novel; the result is that the reader is never able to penetrate beneath the superficialities.

(Barbara Krasnoff)

Why There Is No Life On Other Planets by M. William Trott, B.A., M., M.A. (\$6.95 in hardcover from Vantage Press). Now, you just know that any book with a title like this has got to be slightly off-the-wall. Rest assured, it is, with extra ricochets to spare. According to the cover blurb, "Mr. William 'Bill' Trott was raised in a small Pennsylvania town and reared in Christian philosophy and ethics at home, in church and at Sunday school. Called to preach the Gospel of Jesus Christ, he attended a Baptist seminary and received both the bachelor's and master of divinity degrees." This background, naturally, totally qualifies William 'Bill' to deny the existence of any life form not indigenous to Earth.

His reasonings for stating that Earth is the only "inhabitable" and "inhabited" planet "out of all of God's handiwork" are mind-boggling. One of the best? Says William 'Bill' "We have God's word Himself. 'I have made the Earth, the man and the beast that are upon the ground, by my great power and by my outstretched arm, and have given it unto whom it seemed meet unto me.' (Jer. 27:5)."

"Note," adds William 'Bill', "in this reference that God addresses the people on Earth. Now wouldn't it be stupid and senseless for God to address the Moon or Mars or Jupiter if there were no living beings upon it? Of course, nowhere does God do this because there is no life to address on the Moon or Mars or Jupiter, or any other body in the heavens, for that matter."

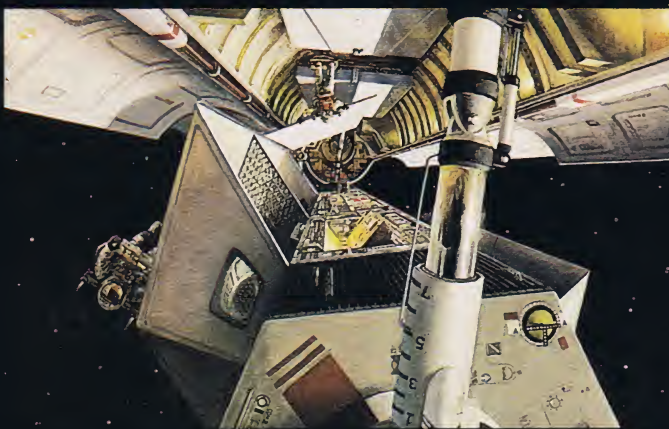
If you can follow that logic, you deserve this book; chockful of quotes taken out of context, charges of blasphemy leveled against SF authors and chapters entitled "The Universality of Sin" and "There Would Have To Be a Second Calvary!" Hot stuff.

(Ed Naha)

Denise Watt-Geiger

What will the first space habitats look like? They probably won't be immense cylinders dotted with scenic lakes and 18-hole golf courses such as T.A. Heppenheimer describes on pages 19-24 of this issue. We'll have to wait a while for those. The very first human communities in Earth orbit will more likely resemble Denise Watt-Geiger's gangly assembly of modules and inflatables pictured in this issue's Gallery centerspread. (The painting is meant to be viewed with Earth at bottom.)

The 26-year-old Houston artist has created a series of scenes depicting a modular, expandable concept for an early space station—an add-on habitat that could be constructed by using a fleet of space shuttles to ferry parts into orbit. The paintings illustrate a two-year study conducted for NASA by Rice University architects John Dossey and Guillermo Trotti. From 1975 to 1977, the two architects con-



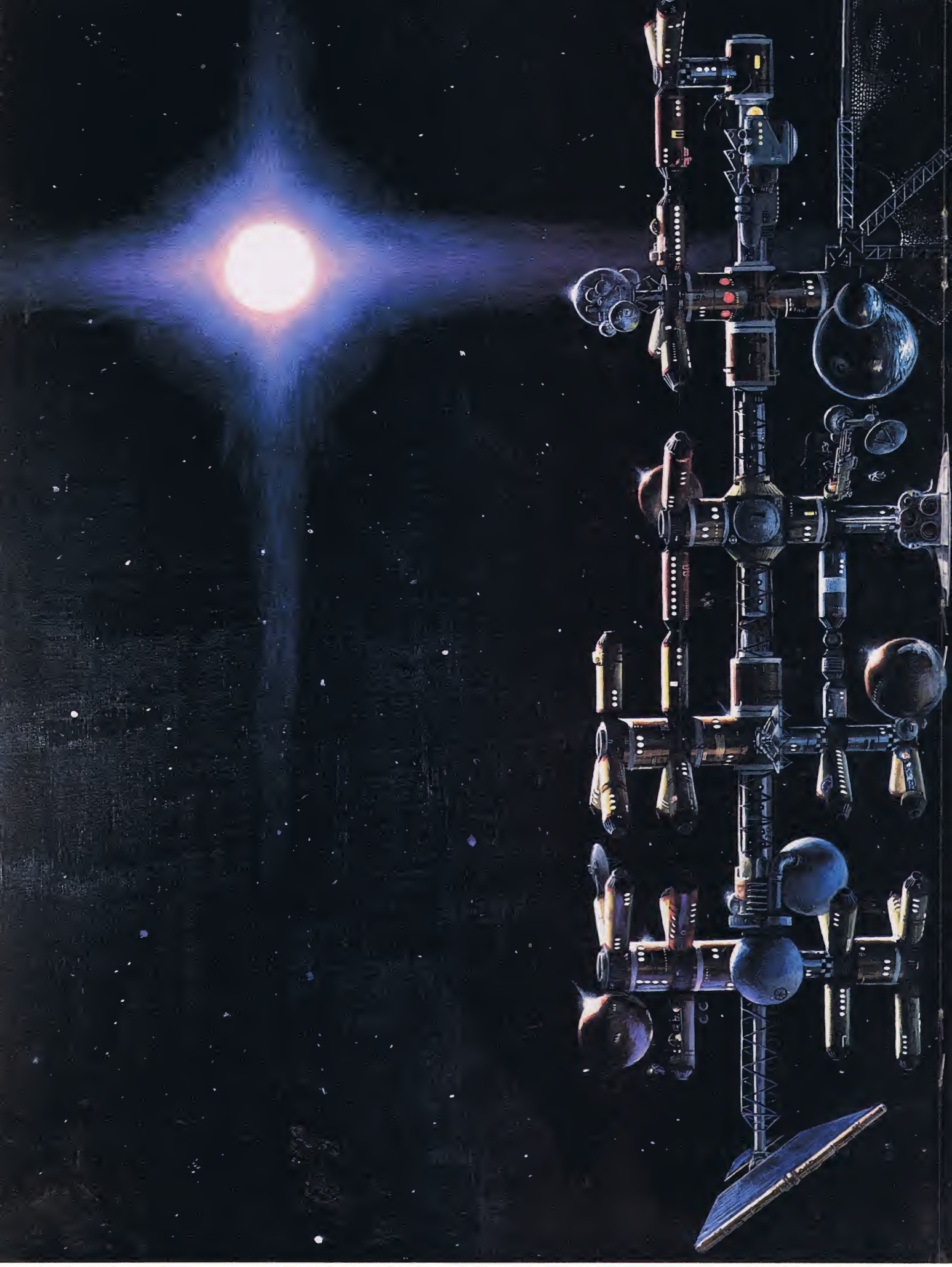
sidered every aspect of an early space habitat, from getting around in zero-g to potential construction methods. They arrived at a modular solution—an expandable community that would grow from a central core and share energy. Three kinds of modular structures were described: finished living quarters and laboratories designed to fit in the space shuttle cargo bay; inflatable structures that would

take their shape once in place (the sphere-shaped sections on Watt-Geiger's space station); and flat plate structures which would be assembled at the site (the process depicted in the painting on this page). Solar power arrays and communications antennae would be foldable and unfurl in orbit.

Working with Dossey and Trotti, Denise Watt-Geiger painted a series of the Rice University space stations (RUSS), il-

lustrating the different forms the modular community might take. (Another version of RUSS appeared in *FUTURE LIFE* #11, accompanying Larry Niven's Tomorrow essay.)

Denise has also illustrated a lunar colony concept for Dossey and Trotti, a painting that now hangs in the Smithsonian Air and Space Museum. Her mass-drivers and space colonies made an appearance on PBS *Nova*'s "Space: The Final Frontier" program. As a freelance illustrator in Houston, she still does some work for NASA's Johnson Space Center, along with other commercial assignments. Her interests lie in science fiction subjects, and in her spare time she conjures up fantastic dragons and imaginative landscapes. ("The dragons are self-portraits," Denise says.) But her first love is painting space hardware of the near future. We just hope that the real hardware of the 1980s and 1990s looks as good as Denise Watt-Geiger envisions it. □







There's a Blimp in Your Future!

By JAMES HOLAHAN and ADAM STARCHILD

Blimps, zeppelins, dirigibles, airships... not your idea of a futuristic mode of transportation? Maybe the lighter-than-air vehicle seems like a relic of the past, and, in fact, the basic technology is nearly two hundred years old. Is it possible, in this era of high-speed jet travel, that the airship may make a comeback?

For many people, the future of the airship was permanently clouded by the demise of the *Hindenburg*, a name now synonymous with air disasters. Unfortunately, although most people probably remember the disaster, not many recall the fact that this German-built, 804-foot-long dirigible airship had almost proved its commercial potential in ten transatlantic crossings before its fateful accident in New Jersey in 1937.

The *Hindenburg* disaster was an accident of major proportions for its time, and for the state of the air industry at that time. Since then, however, major aircraft accidents have put the *Hindenburg* disaster into perspective: between 1900 and 1937 the total casualties due to airship accidents were only 349—about the same number that can die in one major airline crash.

(A more recent accident involving a Goodyear blimp occurred last July when the *Mayflower*, a 160-foot-long craft holding more than 147,000 cubic feet of helium, was caught in a squall over Mt. Pleasant, Iowa. The heavy winds damaged the ship severely, tearing off the mast and ripping the heavy helium bag; no one was injured.)

But can the airship make a comeback as a practical transport vehicle? There are some indications that it can. New construction methods and new, non-inflammable gases will certainly contribute to its desirability. But the most important factor may be the fuel-saving graces of the slow-but-sure airship.

For the uninitiated, an airship technically may be either of rigid, semi-rigid or non-rigid constructions, designed so that the hull may be filled with a gas to make it virtually lighter than air. Once aloft the airship can be maneuvered and propelled forward or backward through the use of auxiliary engines.

Airships have been in existence since 1783, when the French Montgolfier brothers filled a 35-foot paper balloon with hot air from an at-

tached charcoal brazier and sent it aloft. Various technological developments followed; however, it wasn't until 1900 that the first truly practical airship, the zeppelin, was built by Count Ferdinand von Zeppelin, whose namesake was to make Germany the first military air power in the world. The zeppelins were large, slow-moving ships whose rigid metal frameworks supported balloons filled with highly flammable hydrogen gas.

Today's dirigibles are different in several respects from their earlier counterparts. As a rule, they are non-rigid, their shape sustained entirely by the pressure of the gas they contain. The gas now used is helium, which is less efficient than hydrogen but considerably safer. Twin six-cylinder engines and other 20th century refinements have steadily improved the airship, but the basic concept is unaltered: using a gas to freely suspend a heavy vehicle in the air.

Flying for Fun

Traveling by airship is *flying* in the truest sense. This is bird-like flight, with a sense of freedom and relaxation, as opposed to the sensation of being hurtled through the air in a machine. Any balloonist, glider pilot or hang-gliding buff has experienced this feeling, and the growing popularity of those sports attests to the sheer joy of this kind of flying.

The experience of becoming airborne in an airship begins something like this: First, you feel the lines held by the ground crew grow taut; then the lines are cast away and you begin to rise. It doesn't feel like you are rising, but rather that the ground is falling away from you—downward and away—as houses shrink and fields begin looking like a patchwork quilt. Now the view from your window is panoramic; the horizons recede. Finally, after you become aware that you have been *pulled* into the air, the propelling engines start up and you realized that you are being *pushed* through the air.

When the engines stop, you float aloft in complete silence, with just a slight breeze through the open window to tell you that you're really in motion. It is a serene and graceful feeling.

This could be one of the four airships manufactured and operated by the Goodyear

Tire and Rubber Company (now three, with the *Mayflower* out of service). These small airships travel an aggregate of more than 100,000 miles a year and have carried more than a million passengers. Airships similar to these, which fly over the Ruhr and Rhine River valleys for the German firm Westdeutsche Luftwerbung, have also taken many hundreds of airship enthusiasts aloft. Most airship passengers come away extremely excited by this mode of air travel; they would have no trouble explaining why more than 30 members of the British Parliament took to the sky in Goodyear's *Europa* when it was in Great Britain.

Airships as Freight Carriers

Passenger travel by airship may sound somewhat too relaxed for the businessman in a hurry to get somewhere. However, the strongest argument for the comeback of the airship is not for passenger travel, but for cargo transport.

For example, the transportation of freight by airship offers some important advantages; as the original vertical take-off and landing aircraft, it can transport cargo from England to Australia—via the polar route—in four days, about one-fifth the time it takes a sailing ship to make the same trip. As another example of the time and money saving potential of the airship, it is possible to transport cargo (containerized for expeditious handling) from Miami to Puerto Rico in seven hours. The most notable advantage of this kind of freight airlift is that it would eliminate the ship-to-truck-to-warehouse transfer of goods; the airship could unload its cargo at its final destination.

In the future, this kind of operation could be carried out by a special heavy lift airship. Using technologies already developed, the giant vehicle would be propelled by helicopter-type rotors and would have a lift capacity of up to 160 tons. According to Morris B. Jobe, president of Goodyear Aerospace, it would take approximately two and a half years and \$15 million to verify the craft's safety and usefulness through a series of wind tunnel and other dynamic testing. Another three years and \$70 million would then be needed to get the initial airship, a smaller version with a lifting capacity of 75 tons, into the



Airships equipped with helicopter rotors will be able to lift heavyweight cargo.

air. Total cost for development of this fuel-efficient transport: less than \$100 million.

Natural Gas: A Unique Cargo

An English team called Aerospace Developments, backed by Shell International Gas, is currently developing plans for a giant airship—approximately one-third mile long—for the transportation of natural gas from North Africa to Great Britain. If this extremely ambitious project is successful, it could give the airship industry a decided advantage over the highly specialized ocean-going vessels that are being mulled for that purpose. The very cargo of the ship, natural gas, becomes a lifting medium when it is

suitably helium-shielded for safety. Since Shell International Gas is not noted for mixing business with an indulgence in science fiction fantasy and airship nostalgia, this is a plan that might just prove viable.

Worldwide Interest in Airships

The Soviet Union, certainly no novice in air travel, already uses simple airships as flying cranes on construction projects, and has published and discussed at least seven new designs for commercial airships. The East Germans have established a board for research into airship design. One result of this research has been the new *Dolphin* design, which resembles a flying catamaran.



The technologically advanced Goodyear blimp *Mayflower*, before her crash last July.

There will probably be a revival of the airship industry in the United States, despite the fact that the U.S. attempt to exploit this kind of transportation between 1920 and 1940 was not spectacularly successful. A conference sponsored jointly by NASA, the U.S. Navy and the Massachusetts Institute of Technology has investigated the technology and economics of airship transportation. However, none of the organizations has ventured the opinion that a market for airship passenger travel can be developed in competition with aircraft of the *Concorde* class. They do emphasize, however, that modern airships have gained a large safety factor over those of the past. And the supersonic travel industry is already threatened by fuel shortages.

Function Follows Form

Before fully answering the question concerning the comeback of airships, we must answer the major question: Who wants to fly slowly? In this jet age, the answer might seem to be: no one. However, there are many applications, when all factors are considered, where slow flight is not a major drawback. For suggested applications, let's consider *Skyship*, an airship designed by John West.

Skyship is saucer-shaped, 700 feet in diameter and 200 feet high at the center. Its basic design makes it applicable to freight transportation. It could, for example, lift 1,100 tons of containerized freight at an expense of one cent per ton-mile. The necessary ground terminals for this ingeniously constructed craft would be neither overly large nor exorbitantly expensive.

Moreover, *Skyship* could have a military application: In one lift it could transport two complete infantry battalions, complete with equipment and 100 tons of supplies. It would take 105 conventional aircraft to do a comparable job.

As to the question of who wants to fly slowly, the sponsors of *Skyship* can envision 280 autos and/or campers, occupied by 750 persons, being ferried from London to Italy. This trip would take about 10 hours flying time and would be an innovation in tourism.

Or how about a round-trip flight between New York and Washington—at a cost of only about \$20. Or, consider a 40-hour trip from New York to London (complete with full conference facilities in both directions) for ordinary fares of \$50 or luxury rates of \$100. When freight routes and intercity terminals are built, this 1,600 passenger airship could make these kinds of flight bargains a reality.

The firms involved in the development of airships are not, however, at this time promoting the idea of airships as commuters' dreams-come-true, but as an economical medium for freight transportation. Paradoxically, the very factor that seems to work against the comeback of airships may bring an advantage in this energy and environment conscious world: A jet aircraft travels faster, but uses *three times* as much fuel per passenger as an airship. And the futuristic *Concorde* may use up to *16 times* as much fuel as an airship—a good argument for the comeback of the graceful dirigible. □

PHOTO: GOODYEAR

Jojoba: A Whale of a Plant

Jack thought he'd found a pretty good thing when his magic beans sprouted that cloud-climbing beanstalk which led him to the pot of gold in the sky. Well, move over Jack and beanstalk, 'cause here comes jojoba (that's *ho-ho-ba*, from the Spanish pronunciation). If there was ever a magic plant, the jojoba is it.

Basically, the jojoba is a rather unimpressive-looking woody shrub that grows unobtrusively in arid to semi-arid climates, producing a small oil-bearing bean. The pure, chemically ideal oil is the beauty of the plant. To date, jojoba oil has been found superior to petroleum-based products in the manufacture of such essentials as penicillin and plastics. But like nothing yet discovered, the jojoba is nearly identical—and totally equal in nature to—sperm oil, the primary by-product of the endangered sperm whale. So, not only can commercially produced jojoba help relieve our petroleum-starved world of its increasing oil dependence, but this modern-day magic bean might well be the salvation of the last of the great whales.

The sperm whale is one of the most fiercely and savagely hunted creatures in history; despite their endangered status, hundreds are still slaughtered each year. The prize is the valuable head of the cetacean, filled with a solid, white wax called spermaceti, and a liquid wax called sperm oil. Its unique properties make sperm oil an ideal lubricant for heavy machinery, automotive transmissions and other equipment that requires a high-pressure lubricant that will also withstand super-high temperatures. Though the United States (with other nations) has banned the use of sperm oil (under the Marine Mammal Protection Act and the Endangered Species Act) and now retains only an emergency stockpile, American industry, until recently, went through more than 50 million pounds of the oil each year.

The jojoba is no shrub-come-lately. Natives of northern Mexico and the southwest U.S. have been utilizing its oil for centuries; as early as 1769, the Spanish missionary Junipero Serra reported seeing California Indians cooking with jojoba oil and using it to heal wounds. Indigenous to the Sonoran Desert (along the Arizona-Mexico border), the jojoba's cells and enzymes went through some unique evolutionary growth, and today, unlike any other plant, it produces absolutely no glycerol. Rather, it combines fatty alcohol with fatty acids to form a liquid wax with an unusual chemical makeup. Indeed, it is the only known substance on Earth that comes close to duplicating the precious sperm oil.

In its desert environ, where typically little



grows (with all due respect to cacti and Gila monsters), the remarkable jojoba has flourished. In fact, the deep-rooted bush can survive and bear beans with but a miserly four inches of rain annually; but like all good plants, the more moisture it gets, the more plentiful its output of fruit. The jojoba also has an amazing tolerance toward salt (a sure death for most plants), a thankful attribute considering the high concentration of salt in desert soil. Comparable in dimensions to a suburban hedge, the hearty jojoba can, under optimum conditions, attain a height of ten feet and produce at least nine pounds of oil per year, harvestable after three to five years. A healthy specimen will proliferate for a minimum of 100 years; some have reached the two-century mark. The plant requires minimal care and maintenance, and at a relatively low cost, literally hundreds of jojobas can be planted per acre.

The value of the jojoba as a replacement for sperm oil was discovered decades ago; it is only recently that the possibility has been seriously considered, especially in light of the unpopularity associated with whale killing. In the same light, jojoba's petroleum-like character is garnering more and more notice in the wonderful world of oil crises. The attractiveness is unavoidable: Only ten percent of our nation's imported oil goes into the production of gasoline, diesel fuel, heating oil, lubricants and solvents; the other 90 percent is used in the manufacture of fabrics, plastics, medicines and other products. With what is already known about the potential of the jojoba, it could replace this 90 percent, and thereby contribute to further diminishing our oil imports. What's more, when hydrogenized, the jojoba forms an extremely hard wax second only to carnauba, which is in high demand in industry, but must be laboriously and expensively scraped from the fronds of a palm tree that grows only in Brazil.


Scientists have been aware of the inherent

beauty of jojoba since the 1930s, but the desirability of commercially cultivating the wild bush has only recently surfaced. Along with research conducted during the past several years, isolated studies have found the jojoba's products compatible in various applications. Most notably, when compared to the conventional petroleum-based manufacture of life-saving penicillin, jojoba was found to be superior. Other important uses for the oil include resins and plastics, low-calorie cooking and salad oil, lipsticks, sun tan oil, hair oil, baby oil, shampoo, acne treatment, chewing gum, printing ink, carbon ribbon coating, linoleum, car and floor wax, varnish, pill coating, candles, cutting and grinding oil and detergents.

Like any great idea, jojoba is beginning to receive worldwide attention. Continuing studies and international exchanges of information are going on at several facilities, including the University of California at Riverside (the site of an international jojoba conference last year) and the University of Arizona. Japanese scientists, possibly spurred on by a government whose continued exploitation of sperm (and other) whales draws such harsh criticism, have shown a keen interest in the jojoba and purchased several tons of refined oil for their own studies. A few years ago, the World Bank and the Israeli government spent \$1.4 million to plant jojoba in the Negev Desert; today, Israel is second to the U.S. in jojoba growth.

So what's the hook? Why isn't everybody planting jojoba "victory gardens" out back? Well, don't think that there aren't all kinds of get-rich-quick businessmen just dying to sell you jojoba seedlings. Several companies have cropped up, though most are reported to be reputable. Nonetheless, it must be realized that jojoba is still a wild plant that cannot just be plucked up and cultivated like soybeans or wheat. There has been much promising work toward domesticating the plant, but the days of jojoba agribusiness are still several years down the line.

Jojoba might also become a vital new resource for impoverished desert areas, offering an economic agri-boon to many parts of the world. Presently, in conjunction with the University of Arizona, the San Carlos Indians have initiated a cooperative jojoba business, complete with a small plantation and one of the few existing jojoba oil "refineries."

It's almost too good to be true: A shrub that stands not only to save the sperm whales from extinction and ease the world of some of its oil woes, but also to create a renewed existence for indigent arid regions and reclaim deserts. What a plant! Viva jojoba! 



Filming Doomsday is no easy task, even at a cost of nearly \$20 million.

METEOR

The Movie

This fall, executives at American International Pictures will be yelling "the sky is falling!" in an effort to drum up business for their new blockbuster release, *Meteor*. The most expensive film in AIP's history, the \$17 million opus has lived up to its reputation of being the *ultimate* disaster movie. Nearly three years in the making, *Meteor* has managed to overcome budgetary woes, shooting delays, special effects breakdowns and postponed unveilings in its attempt to bring doomsday to the screen.

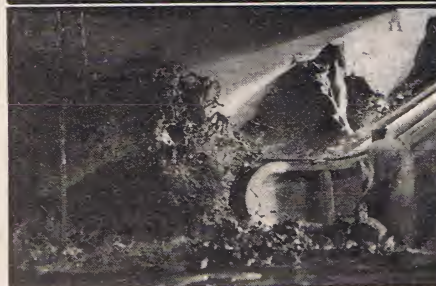
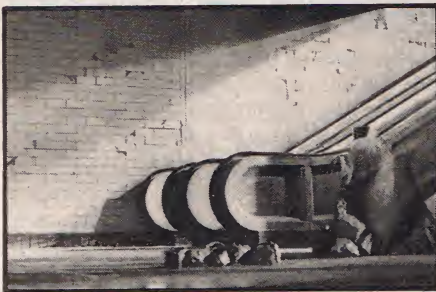
The fictitious tale of global woe begins when a massive asteroid, Orpheus, is struck by a comet in space. The asteroid is splintered into thousands of pieces, a cluster of which heads for Earth. When the U.S. notices the disaster-in-the-making, they put into action a satellite system, previously designed by NASA

scientist Paul Bradley (Sean Connery). The satellite contains 14 nuclear warhead rockets capable of deflecting space debris from a collision course with Earth.

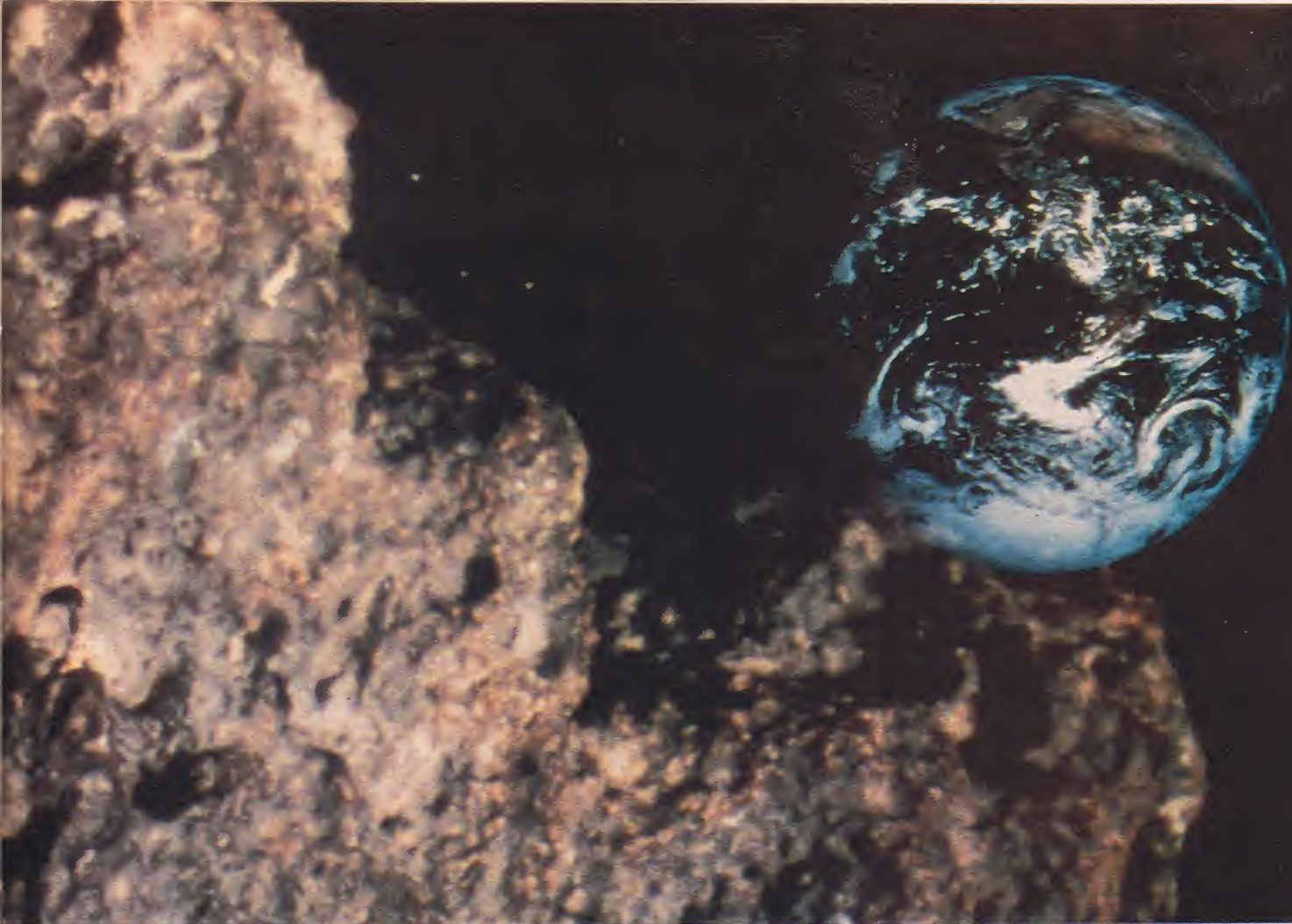
Bradley is called to action by NASA chief Harold Sherwood (Karl Malden) and is paired with General Adlon (Martin Landau), now in charge of this defense system, dubbed *Hercules*. Near panic sets in at the control center when a manned space mission, *Challenger*, is re-routed to catch up with the asteroid debris and to relay a first-hand report of the damage back to Earth. The astronauts discover that the largest piece of meteor is some five miles in diameter and is approaching Earth at a rate that will give the planet only *six days* to prepare for collision.

NASA contacts the Russian government to warn them of the impending doom and enlist their aid in mounting a workable defense. Politics prove to be just as deadly a nemesis as the meteor and the two governments drag their heels over the prospect of cooperation. Before the powers can join forces to blast the meteor out of the sky, both have to admit that they have orbiting missiles trained on one another. Finally, Dr. Duboff (Brian Keith), Bradley's Russian counterpart, is sent to the *Hercules* control complex, accompanied by his assistant-interpreter Tatiana Donskaya (Natalie Wood). Duboff's system, *Peter the Great*, is linked by computer to *Hercules* and the world awaits the coming of the meteor.

Meanwhile, smaller rock fragments precede the mammoth five-mile intruder. Screaming into the Earth's atmosphere, the meteors hit Siberia, Austria, Hong Kong, Rome and



Top of page: *Meteor* director Ronald Neame on the set. Extreme left: Under pressure from falling meteor fragments, New York's Hudson River goes on a rampage unleashing a wall of mud throughout the city's subway tunnels. Left: A mud-soaked subway exit.



New York City. The New York strike throws the Earth defense line into an uproar. Located below the ITT building in the Wall Street area, the computer control complex is badly damaged. The *Hercules* workers attempt a hasty escape, fighting their way through a nearby subway tunnel. Tons of water and mud begin pouring into the catacomb from the adjacent Hudson River. Meanwhile, *Peter the Great* and *Hercules* still take orders from the crippled control center. The meteor draws nearer. The *Hercules* workers battle a titanic mud slide for their

lives. The fate of the Earth rests upon a deserted computer system located beneath a crumbling metropolis...

The mind-boggling escapades of the runaway rock in *Meteor* originated some three years ago when producer Ted Parvin read an article in *The Saturday Review* by Isaac Asimov, who wrote: "We now live with the knowledge that there is a chance that at any moment a large meteorite or earthquake may demolish a city on Earth." The idea immediately appealed to the movie-maker.

He presented the idea to his partner Arnold

Orgolini. "He almost yawned," Parvin recalls. After a two-hour discussion, Orgolini was sold. Parvin prepared a 32-page treatment of a disaster-from-space story which was presented to potential backers. The movie's massive scope required quite a bit of money, hence quite a few backers. As a result, the finished film's list of producers reads like a roll call of moviedom. Movie ads proclaim: "Samuel Z. Arkoff Presents A Sandy Howard/Gabriel Katzka/Sir Run Run Shaw Presentation: *Meteor*, Produced by Arnold Orgolini and Theodore Parvin."

After Stanley Mann and Edmund North wrote a suitable script, Ronald Neame was signed to direct. Then, the headaches started. For the past two years, the Earth's partial demise on film has caused quite a few furrowed brows for executives at AIP. The difficult miniature effects caused special effects aces to enter and exit the project on an almost revolving door policy; the oversized live effects nearly caused the exit of a few members of the cast.

Catastrophes, it would seem, are just not easy events to pull off realistically unless one is willing to make sacrifices. In one scene, for instance, where a New York subway tunnel is



Top of page: The largest meteor fragment zeroes in on Earth. *Meteor*'s difficult special effects sent the film soaring over budget and beyond its shooting schedule. Left: The astronaut team spots the meteor in space.



When the meteor strikes, there is no safe place to hide... as this hapless actor finds.

flooded with mud, 18 miles of lumber and 9,000 pounds of nails had to be used to construct a full-scale tunnel—consuming a total of 20,000 man-hours. When it came time for the actors to actually become trapped in the ocean of sub-strata ooze, over a million pounds of man-made mud were poured onto the cast over a period of three weeks. This ordeal prompted Sean Connery to comment, "This is the most frightening set I've ever worked on. There are a couple of hundred actors and crew here and I assume, at the end of the day, that they're still here." Each participant in the flood was assigned a "watcher," a supervisor whose job it was to make sure that none of the stars disappeared beneath the slime for real.

Producers Parvin and Orgolini parlayed over \$17 million into the production. The cast and crew filmed on location in Hong Kong, New York, Austria, Germany and Italy. The two producers reconstructed the U.N. Security Council room at a cost of over \$100,000, designed the *Hercules* control center at a cost of one million dollars and poured nearly three million dollars into miniature effects.

For Parvin, however, the money, the long delays (special effects problems caused the movie to miss its original May of '79 release date) and the hard work were worth it. His

movie, he feels, is different than your average *Star Wars* or *Superman* screen SF fare. "Our story is more human and deals with the factual. I think you can thrill an audience or frighten them or produce whatever emotion you want better by presenting a factual situation rather than a fantasy one."

To support his claims, Parvin is discarding the oft-used "science fiction" label in favor of a new one: "science faction."

"We have ample physical evidence that meteors can do everything we say they can do," he states. "Consider the Barringer

cessful. I'm eternally grateful to it because it's given me a certain amount of financial independence. So I can be a little more careful, perhaps, about the films I choose to make from now on."

It was when Neame was up to his ankles in disasters on *Poseidon* that he was approached with an even bigger calamity: *Meteor*. Recalls the filmmaker: "I met a designer who said 'I'm working on a picture called *Meteor*, and I want you to come and do it. It's about this five-mile piece of rock that hits the Earth.'



In Robbie Blalack and Jamie Shourt's finale, the meteor fragments meet the Earth-saving missiles in a carefully choreographed duel of traditional good vs. evil.

crater in Arizona, the one in Siberia that hit in 1908, the large crater in Australia, and, of course, if you want to see a crater any day of week, all you have to do is point a low-power telescope at the Moon. You'll see hundreds of them." —Michael Estaban and Lem Pitkin

The Director

American International Pictures has high hopes that their effects-laden movie epic, *Meteor*, will capture a vast audience hungry for a spectacle of doom, disaster and heroism. It may be, however, that the film's greatest assets will be the intangible qualities brought to it by its director, Ronald Neame.

The British filmmaker, best known for such classics as *Tunes of Glory*, *The Prime of Miss Jean Brodie* and *The Horse's Mouth*, found himself approached to direct the space spectacular after helming his only previous disaster film, the successful *Poseidon Adventure*. For Neame, a craftsman concerned with small-scale, "people-oriented" films, *Poseidon* proved a titanic and somewhat unnerving experience.

"I never was very proud of the film from a directorial point of view," he confesses from a Los Angeles *Meteor* set. "I never thought it would enhance my reputation in any way. But we did make a picture that was highly suc-

"I said, 'Oh come on, I don't want to get back into *that* stuff again.' But he was very persuasive and intrigued me enough to want to hear more about it. He must have passed this on to the producers, Ted Parvin and Arnold Orgolini, who came to me with an offer. I didn't want to do it, initially. It sounded too similar to the *Poseidon Adventure*. And I was more interested in making movies about people rather than big rocks.

"The producers talked to Sandy Howard, who is this great packaging gentleman. Sandy thought it to be a splendid idea and brought in another packager and producer, Gabriel Katzka. Gabe also asked me to come in on it. Then someone was hired to come in with an outline, a rough story about a meteor hitting the Earth. Sandy and Gabe, being good showmen, organized this lovely brochure

Right: The Hercules defense post, located far beneath the streets of Manhattan, is buried by debris as fragments of the space rock level New York City. The entire sequence calls for the whole of New York City's subway system to be inundated with a sea of mud. To film the destruction scenes, the *Meteor* crew had to build a section of subway on a sound stage. Far right: Karl Malden and Joseph Campanella receive news of the meteor's progress from the astronauts.

showing a meteor hitting Manhattan Island with great buildings collapsing.

"Now Sandy and Gabe go off to the Cannes film festival. Cannes is a marketplace and there was great interest. In about ten days they had, in theory, raised about \$10 million. Now, I can struggle for months and months to raise two million dollars for a small, intimate picture for which there is already a script. But this industry is such that they could raise \$10 million on a color brochure and a ten-page outline.

"So there they were with \$10 million and no script. I don't think, at that stage, that I'd have had anything to do with the picture—if I had not noticed something in the story that went a little bit beyond the run-of-the-mill disaster story. Suddenly, there were several scripts around. None were very good, but one thing was stated very forcefully... if America and Russia don't find some way to collaborate, then we're all in for it. I thought that was worth saying.

"In the story, the meteor can be stopped only by the two countries bombarding it with nuclear weapons launched from orbiting

space stations. America is forced to admit that they have a satellite orbiting with 14 missiles with nuclear warheads aimed towards aggressive nations. Whether or not that's so in real life, I don't know. We've talked to U.S. officials about it and, when the subject is broached, they grow silent. Nobody has said that it *isn't* so.

"In the film, the Russians refuse to admit that *they* have such weapons but nevertheless send an astrophysicist to work with his American counterpart to decide, hypothetically, what could be done to stop the meteor *if* Russia had such a weapon.

"These two astrophysicists, even though they can't speak each other's language, understand each other. They know each other as scientists. But the bloody bureaucrats, the United Nations, the army—all the characters who sit up there and, let's face it, control our destinies—cannot work together. *Meteor*, then, makes the further comment that *people* can get along if they have to. I thought this was another good reason for doing the picture.

"Then, I began to think of the musical side of *Meteor*. Immediately, I thought of the finale of the *1812 Overture*, where you have the cannons going off, and the bells, and the rich mixture of the Russian and French anthems. I thought: Now here we have these fantastic satellites with nuclear weapons—*Peter the Great*, which the Russians finally admit to, and the American one, *Hercules*. What an opportunity to mix Russian and American music!"

By then thoroughly hooked on the project, Neame agreed to direct *Meteor*. His first chore was to improve the script. One of his early additions was the character played by Natalie Wood. "Funny how these things come about," Neame muses. "Everybody said 'We've got to have a girl in the picture.' I thought, if we've got to have a girl, then she's got to be integral to the story. That's how I thought of the female interpreter for the Russian scientist. Naturally, from that idea, one goes right to Natalie Wood, because she is Russian, and her Russian is fluent."

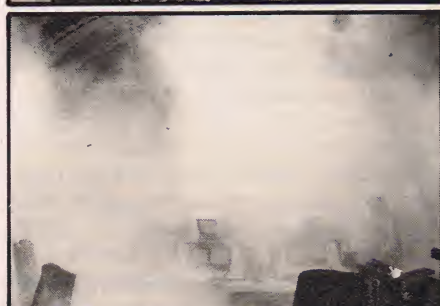
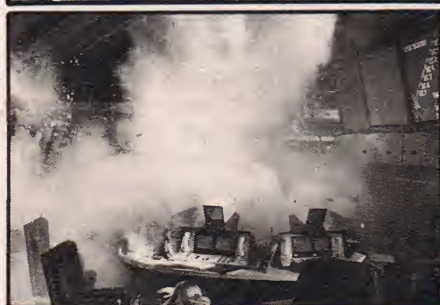
Once the film was cast, production commenced and, from the director's point of view, everything went well. "Until the mud scene!" he hastily injects, in reference to the climax of the film, when the movie's heroes are engulfed by a tidal wave of mud that breaks through the city's subway system and roars throughout the metropolis' tunnels.

"Even though I had had experience in the *Poseidon Adventure* with masses of water, *mud* turned out to be a very difficult thing," Neame recalls. "First of all, there was a problem of what to use for mud. One couldn't expect the actors, or indeed anybody, to wallow around for ten days in real mud. We had to have a chemical mixture, a manufactured mud that would look like real mud but would not harm people's eyes or be dangerous to swallow or inhale. A lot of research went into finding the right mixtures.

"Then, new problems arose. For years motion pictures have used big tanks for water that is released to wash down on the actors, but nobody had ever had mud do that. We had big problems here. In order to carry the weight of our mud, the entire studio had to be reinforced. We had to build tanks outside the studio and make a hole in the wall to feed the mud into the studio. Then, we found that even though we had an enormous amount of mud, if the shot ran for any length of time—as they invariably did—the mud was used up. We had to devise a way to get the mud back again, into the tanks, and recycle it. So we let it flow through the studio floor into a tank below, where big pumps sucked it up and took it 'round back up to the top.

"Then there was the cold. We couldn't heat the mud very much because it steamed. Yet, we couldn't expect the actors to go into the cold mud. Everyone suggested that we use doubles. Well, if you use doubles, you can't go in for close shots. We did it without doubles. In fact, there are no doubles used anywhere in the picture."

Because of the film's complicated plot line and manifold action sequences, Neame shot the film as much in sequence as possible in order to allow the actors to gradually ease in-



to the tension of the film. Additional tension was provided by the location shoots and the problematic special effects.

"Hong Kong was a headache," Neame says. "Hong Kong has notoriously bad weather and I had to shoot a whole sequence there in about eight days. We had problems with the Swiss sequence, too. We decided to shoot in the Austrian Alps. It seemed like just the right location. But when we arrived there, there was no snow! They said, 'This is the first time this has happened to us in 50 years!'"

Adding extra headaches were the picture's miniature effects; effects that caused the release of *Meteor* to be delayed by half a year. "All the pictures that have special effects in them have gone back on their release dates," Neame says philosophically. "I don't care which one—*Star Wars*, *Superman*, all of them—they push it back and back because the effects are such hit-and-miss operations. It's not just a matter of shooting film; every effects shot involves many elements. Superimposition, mattes, miniatures—really big productions."

During the shooting of *Meteor*, effects teams came and went, with effects shots being staged and restaged for over a year without passing grades. "The early effects work just wasn't good," Neame says. "It was simply not of the quality needed for a picture of this size, and importance, if you will. There came a point when we had to say: Do we go on like this, or do we have a clean sweep and begin again? The consensus was that we should begin again, and we did. To be quite honest, I think that was the only thing we could do."

According to some inside reports, the cost of the first batch of discarded effects footage was in excess of \$750,000.

Despite the astronomical budget, the cosmic special effects and the mammoth scope involved in mounting *Meteor*, Neame feels that he has managed to convey a sense of humanity, of personality of the same caliber as was found in his "two million dollar small, intimate pictures."

"I like making a picture that, when you come out at the end of it, you come out feeling good—you feel that there's hope in the world. I still think that right should overcome wrong. Terribly naive of me, I know, but nevertheless I think it should."

One of Neame's favorite human touches involves a scene between the Russian scientist (Brian Keith), his translator (Natalie Wood) and his American scientist counterpart (Sean Connery). "I wanted my Russian scientist not to speak any English," says Neame. "Everyone said to me 'You cannot have a commercial film for a mass audience and have somebody speaking Russian all the way through!' But I fought for it because it was going to be good. One of the best sequences came out of that."

"During the first conversation between the three, the Russian, Brian, says something in Russian. Sean is listening. Natalie says, 'Dr. Dubov said, You will find it very difficult to hit a meteor in outer space with your rockets aimed towards the USSR.'"

"Sean looks at this Russian and says, 'We call ours *Hercules*. What do you call yours?'"



American and Russian missiles on a collision course with the massive menace from space.

Natalie translates that to Brian who says, 'How can we have a name for something that doesn't exist?'

"So, Sean goes over to a board and flicks on a light where you see the Russian satellite. He says, 'Well, who put this thing up here, this thing called *Peter the Great*?'"

"Natalie translates this and Brian smiles and says something in Russian. Natalie turns to Sean and says, 'The Chinese, perhaps?'"

—David Houston

The Special Effects

"Without a doubt, *Meteor* is the fiasco film of Hollywood," says one of the production's insiders. "It cost \$17 million dollars to make and doesn't look it. It's probably put a lot of water on the fire for people who want to make this type of picture."

The anonymous speaker is referring to the production's now almost legendary problems with achieving realistic special effects depict-

ing the film's more spectacular destruction and space scenes. Initially slated as a spring of '79 release, it was pushed back to summer and, finally, this fall.

Problems first surfaced on *Meteor* early this year when effects concocted by the film's effects team were nixed by studio heads. The scrapped footage included the inundation of Hong Kong, an avalanche sequence in which a village is destroyed and portions of the destruction of Manhattan. Director Ronald Neame, who was in on the decision, stated simply that the submitted effects didn't have the "quality that's required for a picture of this size, and importance, if you will."

A second crew of SFX experts was hired. Reports vary as to what both the old and the newer effects looked like in the daily screening room, but one company executive recalls, "At one point, we were supposed to be looking at an asteroid belt in space. Dry dog food, kibble, was used to simulate real meteorites. Everyone looked at the screen and exclaimed

at once "Why, that's *kibble!*"

With the second crew working to meet a fall deadline, AIP decided to contact Robbie Blalack and Jamie Shourt, of *Star Wars* fame, to help pull the production out of the danger zone. "They brought us in about two months before the film was supposed to be completed," recounts Blalack. "There had, essentially, been two years of special effects work that didn't pan out.

"It was sort of an interesting situation. Essentially, they were asking us to do in two months what couldn't be done in two years. We said yes. We've developed a very special high-speed, computerized camera system that's a lot faster and better than existing systems. We used it to give them the entire finale of the film, the destruction of the meteor itself.

"We knew that the film had gotten itself a strange reputation in terms of its effects. We agreed to take the job because we felt that to do it correctly would be an investment in the future of special effects."

Because of time limitations, the two technicians were forced to use most of the miniatures already constructed for the film, although they did build large section details of the nuclear rockets and meteor fragments. "The launch of all the missiles and the final destruction of the meteor was our biggest challenge," Blalack says. "The sequence had never been filmed to anyone's satisfaction. There wasn't a lot of excitement involved in the existing footage.

"We re-filmed it all and put in a little story of our own. We had the missiles interact with each other. The guidance system goes wrong and some of them collide. There's a lot more cutting down to Earth and having the people at the control station reacting to what's going on in space. We chose camera angles that were a lot more dynamic. We moved the cameras with the missiles. We sped up the pace of the missiles. You get to see close details. Things like that.

"Essentially, we choreographed the scene as if we were using live actors. That's a new approach we're starting to take. It works very well. You use the conventional film grammar of live action and, using effects, you make your models the protagonists. So, by keeping in mind the grammar of film cutting, you're able to have the audience understand the situation very quickly. They can follow the action easier because everyone is unconsciously aware of the standard camera angles used between dueling characters. We found that this system of filming allows you to increase the pace of the cutting without disorienting the audience. It's something that we learned during *Star Wars* but, unfortunately, not in time to use in the final battle sequence of that film. Now, we realize that you can get really *way out* in your effects as long as you follow established patterns of film grammar."

The twosome completed the dramatic space showdown in record time—eight weeks with 16-hour work days the entire time. The movie with the runaway special effects will now, in the opinion of both Blalack and Shourt, be known only as a runaway success

at the box office. "I think *Meteor* will be very successful," says Blalack. "It should calm down those people who were worried about the special effects ruining the movie's chances at the box office. It has a spectacular ending. I think that it will prove that special effects can really improve a movie's story line dramatically. Despite its initial problems, the finished film will keep Hollywood's faith in effects intact. The reason that studios have been willing to invest in effects films in the past is that they realize they have a guaranteed box office response to those effects that is very strong. That's why *Star Wars* made money. *Superman*. That's why *Buck Rogers* can be made for TV for a couple of million dollars and then be released to theaters and

the last 50 years, astronomers have discovered two groups of asteroids of respectable size that regularly pass near the Earth. One group, the Apollos, actually cross the orbit of Earth; another group, the Amors, pass just outside Earth's orbit. By current estimate, there are 500 to 1,000 of these Earth-approaching asteroids a mile or more in diameter.

Rocks on that scale have certainly collided with our planet in the past. Earth is scarred with perhaps a hundred circular rim depressions—some as large as 70 miles wide—which are geologic evidence of catastrophic meteorite impacts.

What would be the consequences of a mountain from space ploughing into the



Front row: Ted Parvin, Neame, Arnold Orgolini and First Asst. Director Danny McCauley are surrounded by the production's cast and crew on the massive defense center set in Hollywood.

do \$25-30 million domestically. All in all," Blalack says with confidence, "*Meteor* will reinforce the impact of special effects movies at the box office."

—Ed Naha

The Facts and The Science Fiction

The producers of *Meteor* state that they don't want to exaggerate the possible dangers of mountain-sized asteroids crashing to Earth. *Meteor* is only a motion picture, they say. Its prime purpose to entertain. But they don't want their film called science fiction; instead they prefer the label "science faction."

How much of *Meteor* is science fiction? How much science fact?

There's nothing science fictional about the basic premise: a miles-wide asteroid on collision course with Earth. Not all the big rocks in the solar system are safely confined to the asteroid belt between Mars and Jupiter. Over

Earth? If it hit in the ocean, tsunamis—walls of water hundreds of feet high—would wreak havoc worldwide, potentially wiping out half the population of Earth.

A strike on land could have even more devastating results. The impact would produce a crater only 10 to 20 miles wide, but the effects would be felt around the globe. The force of the impact would be equivalent to the simultaneous explosion of ten thousand large hydrogen bombs, creating a seismic disturbance 50 times stronger than Krakatoa. The blast wave would level trees and buildings within a radius of hundreds of miles. And some *one billion tons* of soil and rock and dust would be thrown into the stratosphere, where for several decades it would reduce the amount of solar radiation falling on Earth's surface—possibly triggering a new ice age.

There is geologic evidence that such occurrences have happened in Earth's history. And there is astronomical evidence that it

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INTERVIEW

Reaching Into Space

A Conversation With Robert Jastrow

By PAT GLOSSUP

We didn't go to the Moon for science," states Dr. Robert Jastrow. "We went for politics. "But when we got there, we discovered the history of the planets in the first billion years of the solar system's existence."

The conventional trappings of a space scientist crowd Dr. Jastrow's office at NASA's Goddard Institute for Space Studies in New York. Outsize photos of man's first steps on the Moon. A transparent celestial globe. Satellite photomosaics of the United States. Equations scribbled on a blackboard. But there's something else.

Outside the office, three figures stand watch: *Australopithecus*, *Homo Sapiens* and *Homo Erectus*; not exactly what you'd expect to find on a space scientist's home turf. But these bronzes offer a clue to this controversial and brilliant scientist. For he's not a dyed-in-the-equation theorist; he's also fascinated by evolution and the origins of the universe.

A staunch defender of NASA's Moon program since its beginnings in the late 1950s, Dr. Jastrow served as chairman of its lunar exploration group for a year, then later helped to analyze the lunar rocks brought back to Earth.

"We are very interested in what happened in the solar system's first billion years," says Jastrow, "because life on Earth began in that time and we would like to know the conditions under which life arose. Volcanoes, water and wind have worn away the record of the past here on Earth, but we found those conditions on the Moon. That's what we got out of the Moon program."

That was only one of the achievements of the Apollo missions. The \$22 billion invested in the Moon landing program has been returned a thousand-fold, according to Jastrow.

"The money didn't go into outer space," he points out. "It went on electronics, computers, the materials for research...all of which helped America build a competitive

position in the world, strengthen the dollar and enhance the productivity of American labor. That's sheer gold."

The money also went into the development of communications satellites, in which the U.S. holds a commanding position, and into weather and Earth resources satellites.

Applying those space technologies to benefit the people of Earth is one of the major concerns of the Goddard Institute, which Jastrow has headed since its formation. When he was asked to establish a theoretical division to conduct basic research in astronomy and the planetary sciences for NASA, he persuaded the space agency to locate the division in New York, where it could interface with the city's scientific community. In May of 1961, the institute opened its doors near New York's Columbia University.

Dr. Jastrow was born in New York in 1925. He entered Columbia when he was 15, starting out as a pre-med student before switching to biophysics and then to theoretical physics. He graduated from Columbia at the age of 18, received his M.A. in physics at 19 and his Ph.D. at 22.

Soon after graduating, he became a member of the prestigious Institute for Advanced Study at Princeton. There he worked under Robert J. Oppenheimer, whom Jastrow says has been the greatest single influence on his work.

By 1956, Jastrow had deserted nuclear physics for the space sciences. He joined Project Vanguard, the first American program designed to launch an artificial satellite. Vanguard was unsuccessful, but by 1958 Jastrow was making headlines when, at a conference in Moscow, he announced that the Sputnik I rocket could not have come down in North America, as the Soviets believed, but had probably landed in Outer Mongolia.

Upon his return from Moscow, he began work on establishing the Goddard Institute in New York, where he's been based ever since. He is an accomplished author, recently challenging his colleagues with his book *God and the Astronomers*, which raises unanswered questions about the creation of the

universe. As a professor of astronomy and geology at Columbia University, and professor of Earth sciences at Dartmouth College, Jastrow keeps abreast of the latest findings in a variety of scientific disciplines. The Goddard Institute, under his direction, conducts wide ranging basic research for NASA. As one of his co-workers puts it, "The research being done at the Institute reflects his interests and his ability to find the interesting problem and set the scientists to work on it."

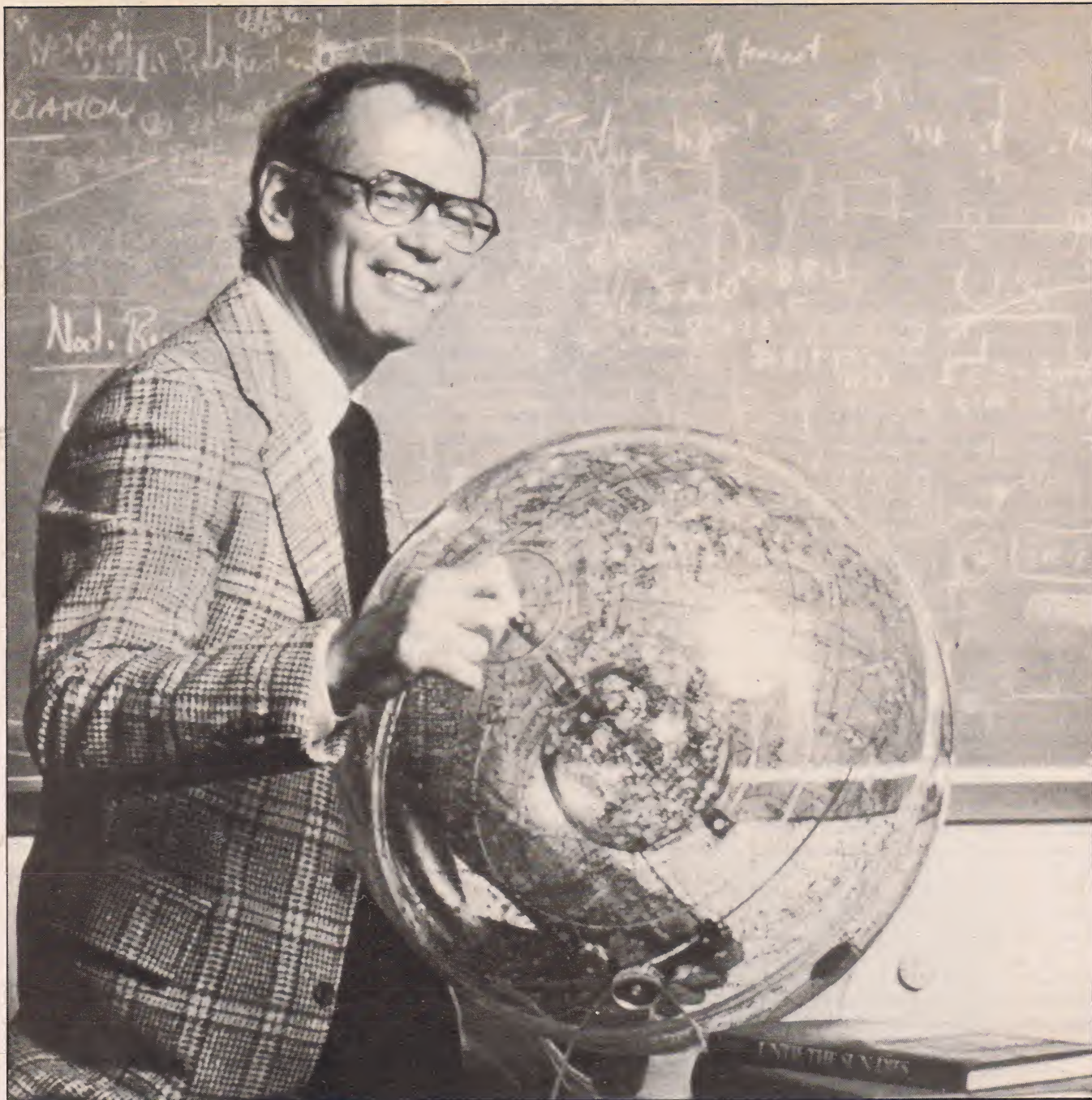
The Institute, which comprises a staff of 200, delves into astronomy; planetary atmosphere, stratospheric atmosphere, and weather and climate; and Earth resources, via Landsat which measures crops, forests, minerals, water quality and population density.

But Jastrow admits that the project that means the most to him is climate forecasts. These are farmers' forecasts of average temperature and rainfall over areas the size of England or the Corn Belt for 30, 60, even 90 days at a time. Such forecasts will be vital to farmers, since knowing if they will have a cool wet summer, a hot dry summer, etc., will help them decide what to plant.

"I think this will contribute more to the welfare of humanity than anything that we or the technologists can do," says Jastrow. "In my opinion, it's the most interesting problem that exists today in applied science."

Referring to NASA's forestation project, he explains, "We can tell what kind of trees are growing in the forests of Maine and New Hampshire from an altitude of 600 miles by the delicate nuances in the color of the radiation emitted, which a satellite catches.

"We can also discover valuable mineral deposits under heavily forested areas like Brazil, Indonesia and Canada, where exploration by jeep and burro costs \$1,000 per square mile. By detecting subtle changes in the color of the vegetation growing over mineralized areas, we can tell where the ore deposits are, at a cost of perhaps \$10 a square mile. This means mineral wealth for the developed and the poor, undeveloped countries, which can transform the face of



civilization.”

These advances, Jastrow stresses, were all byproducts of the Apollo landing.

Since those fateful first steps into space, interest naturally often zeroes in on that vital question: Will we be sending humans anywhere else in space?

Probably not in the immediate future, for as Jastrow explains, “Man in his present evolutionary form could not go to the other planets. On some, like Jupiter, the gravitational force would crush him. On others, like Venus, he’d be dissolved by sulphuric acid.

“But we can send instruments down,” he adds, “and we can land on the moons.”

The last Voyager mission discovered that one of Jupiter’s moons, Io, is volcanically alive. Volcanoes mean water and warmth—the two quintessential elements for life. So, as Jastrow puts it, “It may be that in some closed-in, subterranean chamber of Io,

there’s a simple form of life, and we would very much like to see it.

“Then there’s a moon of Saturn called Titan which has an atmosphere. That atmosphere seals in the moon’s heat and makes for a comfortable temperature on the surface. So there may also be life on Titan.”

The discovery of any kind of life on these bodies, no matter how simple, would be a scientific breakthrough. Jastrow explains, “It will tell us immediately the answer to the biggest question on the mysteries of the cosmos: What is the chance of life evolving on an Earth-like planet?”

Of the three Earth-like planets in the solar system—Mercury, Venus and Mars—only Mars offers promise of life. In his book, *Until the Sun Dies*, Jastrow states that no life conceivable to Earthlings could survive the terrible conditions on Venus, which he calls “a hellhole with searing, oven-hot temperatures

and a corrosive atmosphere of sulphuric acid droplets.” Mercury, the closest planet to the sun, “is airless, waterless, baked on one side and frozen on the other, and clearly without life.” The Viking tests, however, gave positive signals that there was life on Mars. Some of the Viking scientists interpreted them as chemical reactions instead of life, but Jastrow claims that one of those tests is clear evidence of life.

Until all the scientific chips are down, however, we don’t know if the chance of life evolving on an Earth-like planet is one in one—or one in a trillion. If it’s the latter, then we are essentially alone in the universe.

“But if we find life on Io or on Titan or on Mars,” says Jastrow, “then we know that life has appeared independently on two bodies in one solar system. That indicates that the chance of life evolving on an Earth-like planet is very high, and from that we can conclude

"Life forms in the older systems of the universe are as far beyond man as man is beyond beings of a billion years ago. . . We are the worms of the universe."

that the galaxy is teeming with life."

Astronomical evidence has shown that the solar system is only four and a half billion years old, while the universe was created 20 billion years ago. "It follows," says Jastrow, "that life forms in the older systems of the universe are as far beyond man as man is beyond beings of a billion years ago, when the only forms of life on Earth were worms and jellyfish."

"That means that the position of man in the cosmic perspective is extremely low—we are the worms of the universe."

While the imagination runs wild with visions of the senior citizens of the universe, Jastrow is quick to admit he doesn't know what these creatures look like. He's very skeptical of the flying saucer-type manifestation, though he does not discount the possibility of UFOs existing.

"I think that if a voice speaks out of a burning bush," he comments, "that's extraterrestrial, that's a UFO—something that seems miraculous, magical. But flying saucers are a very unrealistic image."

He also points out that *Star Wars*, though a terrific movie, was inaccurate scientifically, as was *Close Encounters*. "Both films portray the advanced beings as flesh and blood creatures. They look like insects or flower children. Yet the mature life of the cosmos is not flesh and blood at all. It doesn't have a brain housed in a hollow shell of bone, fed by blood vessels, from a model developed by the fishes 300 million years ago."

"I'm sure that it's first of all a silicon intelligence, and after that, a disembodied intelligence, completely escaped from its bodily prison. This is the kind of mature life we must look forward to meeting."

"These may sound like foreign ideas," Jastrow adds, "but they are based on a few basic facts: the age of the Earth, the age of the universe, the seemingly inexorable trend towards higher intelligence in the history of the Earth, which seems to have a great survival value. I think we can assume this has the same value in the other planets elsewhere in the cosmos, and from those few facts, the rest follows."

This is Jastrow the evolutionist talking. Now those three bronze figures outside his office start to make sense. Asked who his heroes are in science, Jastrow the physicist lists his big three: Einstein, Newton, then one of the Greeks, maybe Archimedes, maybe Aristotle. But the evolutionist adds, "Alongside Einstein I would put Charles Darwin."

"I think Darwin defined a law of nature—the law of natural selection—as inexorable as the law of universal gravity, but infinitely more subtle, because he had no simple mathematical expression."

"It explains so beautifully the great diversi-

ty of forms that make up the economy of nature. Everything that is happening to animals, to plants, to people, can be illuminated and understood in terms of what Darwin defined in his patient, painstaking accumulation of facts. Yet the physicists have no respect for Darwin. They think he's a simple naturalist, but he's a great mind."

Jastrow explains how he's come to see both sides of the coin. "I'm a physicist, which is very much like being a Jesuit. It's something you are trained in and you never lose it." He admits that his interests have changed from the physics of the nucleus and the atom to the physics of stars and planets, and from there to questions on the origin of life in the cosmos. "But you still think like a physicist," he admits. "You examine cause and effect. You debate the reason behind everything. It's Jesuitical."

Jastrow is actually an agnostic in religious matters, but he did tangle with the theologians when his *God and the Astronomers* was published in 1978. The book discusses what Jastrow considers the most important discovery of the last few hundred years—the one which proves that the world began abruptly.

Supporters of the "big bang" theory had asserted for years that the universe must have resembled a white-hot fireball in the first moments after the explosion that created the universe. The fireball would have become less brilliant as the universe expanded and cooled, but its radiation would never have disappeared entirely.

In 1965, Penzias and Wilson of the Bell Telephone Laboratories clinched the argument when they discovered that the Earth is bathed in a faint glow of radiation which dates back to this moment of creation. (In 1978, Penzias and Wilson won the Nobel Prize for their discovery.) As Jastrow puts it, "No explanation other than the big bang has been found for the fireball radiation. The clincher, which has convinced almost the last doubting Thomas, is that the radiation discovered by Penzias and Wilson has exactly the pattern of wavelengths expected for the light and heat produced in a great explosion."

Jastrow's book on this new theory of Genesis caused quite a stir. Readers responded with a flood of mail. Invitations poured in for Jastrow to address congregations of various denominations—including the Yale Divinity School.

The astronomers who were the butt of the book, however, gave it a cool reception, while admitting that it was a lucid account of cosmology. Jastrow offers an explanation for their reaction: "I think part of it is that scientists cannot bear the thought of a natural phenomenon that cannot be explained. There

is a kind of religion in science. It's the religion of someone who believes there is order and harmony in the universe. Every event can be explained in a rational way as the product of some previous event."

"This faith of the scientist is violated by the discovery that the world had a beginning under conditions in which the known laws of physics are not valid, and as a product of forces or circumstances we cannot discover, since any evidence was lost in the explosion."

It's quite a problem. Science has proved that the universe exploded into being at a certain moment, but it cannot answer the questions this raises. Questions like, "What cause produced this effect?" or "Who or what put the matter and energy into the universe?"

Some answers, however, may appear soon.

Discussing the direction the space program will take in the near future, Dr. Jastrow considers that the most important area will be the continuing exploration of Jupiter and Saturn and their moons. "They are the seedbeds of life," he says. "They have all the chemicals in their atmosphere which are needed to make the building blocks of living matter, and we think that in those planets and on their moons there may be the beginnings of life. Not advanced forms, not intelligent forms, just the beginnings. But this will tell us how life began on the Earth."

Jastrow also considers that, for the first time in the history of man, we may receive signals from other planets. "Ever since 1960 we've been producing television signals at the 10 million watt level. They've been shooting off the Earth at the speed of light and by now they'll have swept past about 50 stars like the sun, some of which may have inhabited planets."

"Allowing 20 years out for the signals, and 20 years back for the reply, we can expect, with confidence, to hear from beings on other worlds by the end of this century."

Who knows how they will respond to old *I Love Lucy* shows and *Tonight* programs?

Meanwhile, Jastrow is following all the developments in astronomy with tremendous interest. "Particularly anything that suggests the presence of forces that are not now within our knowledge," he says. "Whether these forces are the result of a kind of science that we haven't yet discovered, or are the hand of God, I don't know," he admits. "Not only can we not account for things like thermonuclear fusion, we also can't explain what brought the world into being."

"I think there will be a revolution in scientific thought which will raze the current body of science to its foundations, perhaps in our own lifetimes, perhaps in the next century. I welcome that disintegration because I'm very interested to know what will emerge like the Phoenix out of the ashes."



PHOTO © 1979 PARAMOUNT PICTURES

New Faces of the 23rd Century

By JOSEPH KAY

When Paramount Pictures decided to blast off into the 23rd century with *Star Trek—The Motion Picture*, they knew that both a legion of fans and a legion of actors would help make their epic science fiction film a success. *Star Trek*, one of the most popular TV shows ever, had millions of followers who remained loyal to the series during its decade of global reruns. The series also boasted a stal-

wart entourage of actors who had stood proudly by their crewmember roles for a ten year stretch of time, attending *Star Trek* conventions, penning *Trek*-oriented books, recording science fiction records and appearing on syndicated talk shows to discuss *Trek*'s phenomenal popularity.

When filming started last year on *Star Trek—The Motion Picture*, the entire crew of TV's starship *Enterprise* was reassembled

for the widescreen adventure. They were a tight-knit group ready to give their all for the movie. Also on the starship's bridge, however, were two newcomers: Stephen Collins and Persis Khambatta. As the actors portraying the *only* two crewmembers *not* held over from the original series, they found themselves in the unenviable position of being the new kids on the block. While the Federation's futuristic era was familiar territory for the rest

Star Trek's futuristic trappings may be old hat to some, but for the new additions to the movie's crew, they provided an out of this world experience.

of the cast, for the two new faces on the *Trek* set, the 23rd century proved a decidedly bizarre stomping ground.

"It was a very strange experience," laughs Stephen Collins on a TV movie set in Virginia. Collins, in the *Trek* film, portrays Commander Willard Decker, the young fellow who assumes command of the *Enterprise* during the absence of Captain James T. Kirk (William Shatner) and who, subsequently, has to relinquish same to the returning primo Trekker. "Usually when you start working on a film, there's a period of a week or so when everybody gets to know everyone else and gets used to their surroundings. On *Trek*,

that wasn't necessary. Everyone knew each other and everyone knew their way around the ship. Persis and I were like aliens aboard that bridge. We used to joke about it. It was like being the guest stars on the longest TV episode of *Star Trek* in the history of the Earth!"

Complicating matters for both of the new young stars was the fact that neither one of them was an ardent science fiction fan. Collins, in fact, had never even seen an episode of the original show until one week before shooting. "I came into the whole futuristic setting pretty cold," he confesses, "and that made things especially interesting. The whole *Star Trek* phenomenon was new to me. . .

and startling.

"For instance, as soon as we got on the set, the entire cast was given statements from the producers saying 'please don't discuss the script with *anyone*.' The statements were very firm, almost militaristic. I thought it was a little odd and more than a little overdone. Of course, I had no way of knowing that while I was laughing at this piece of paper, people were trying, on almost a daily basis, to break into the Paramount lot and make off with stray scripts."

The film's futuristic setting posed a few problems for Collins as well. "There I was, surrounded by these ultra-modern sets and not having a clue as to what was what. We were given this book of plans explaining how to work all the various consoles on the bridge. All the instruments, you see, were really workable, they were real computer systems. Now, Decker is supposed to be someone who knows all these consoles and is capable of jumping in on any situation and working the appropriate machinery.

"So, I had to memorize these long, long manuals which explained how to work all this stuff. It was like being in school. The manuals weren't supposed to be removed from the set and, when they weren't being read, were kept somewhere under lock and key. I thought I was training for a new career. . . either as a computer technician or a CIA agent."

The actor emits a hearty chuckle. "Boy, were those instructions *technical*. You really had to *learn* what every button was for. I'm glad I crammed it, though. When you're working with computers, if you don't have a sense of authority when you're working them, you look like a real fool. I mean, the Captain of the *Enterprise* had to be able to walk through these consoles with ease. He had to have the simple, off-hand ability to reach over and punch the right button when there are over 500 buttons to push. Initially, I was always afraid of hitting the wrong button and having a TILT sign light up."

Trek's world of futuristic technology eventually became a thorn in the side of just about everyone involved with the film. "The bridge was sometimes unbearably complicated," Collins states. "Some consoles had screens that lit up with rear screen projections behind them. The science console that I operate for a while had four screens and five big honeycomb computer read-outs. The script supervisor used to go crazy over that particular machine. He had to make sure that, if during a master shot the projector was showing one image, the same image had to be projected onto the screen during the subsequent close-up and different angle shots. Sometimes we had to wait through an entire film program to shoot a scene. We, the actors, would be ready, but the monitor screens wouldn't be synched up yet. There were odd little things like that that held up shooting. Things I'd



Above: New and old faces. Back row, left to right: Leonard Nimoy, DeForrest Kelley, Steven Collins and Persis Khambatta. Foreground: William Shatner.



The new *Enterprise* bridge features consoles consisting of working computer systems; a stumbling block for the actors involved.

never encountered before. We were all patient about it though. We all sacrificed a sense of frustration to make this movie the best it could be."

For Persis Khambatta, her sense of sacrifice for the sake of filmed futurism was a bit more personal. In the role of Ilia, the movie's resident Deltan, she was called upon to shave off her hair, a professional move which had some dire repercussions in her personal life. "Most people were very positive

about it," she stresses from her California home. "But, to be very honest about it, I wouldn't have given a damn if they hadn't liked it. Some men friends, who hadn't as yet seen me bald, said that they wouldn't take me out in public. I said, 'Fine, that's okay with me, goodbye.' But there wasn't anyone who saw me bald that didn't like it.

"Being bald for *Star Trek* changed my personality in many ways. I had more confidence in myself when I was bald. I had to be *myself*. I couldn't be anyone else. When you have hair, you're immediately one of the crowd. Bald, you are alone. You can't hide behind a stylish hairdo. You are alien. As a result, the people you meet want to know *you*. When you're bald, you feel strange, alone. What an experience!"

When not expanding her consciousness through skin-power off the set, Persis was using her sleek look to help accelerate her acceptance on the *Trek* set. "People gravitated towards me," she smiles shyly. "Bill Shatner would come over and pet my head between takes or give me a kiss on the forehead. Everyone loved my head. I felt like I was a purring cat. It certainly made me feel less nervous about doing the movie."

Until her baldness triumphed, however, Persis confesses to feeling a bit alienated on her first days aboard the *Enterprise*. "Being on the *Star Trek* set after watching the show on TV was frightening. My worst day was my first day. I was so nervous I couldn't remember any of my lines. I felt like a school girl who stutters when she's called upon to recite. But everyone was very nice to me. They made me feel like I was part of the old crew."

Once assimilated into the *Trek* society,

Persis, too, found that she had to grapple with studio security precautions. "It was very funny," she laughs. "I couldn't leave the studio bald because they didn't want me to do any publicity for the movie during the first two or three months. I had to stock up on hats and things to cover my head. When I left the studio, I was bundled in all these *things*. I wasn't an actress. I wasn't an alien. I was a fashion plate."

Today, the filming is over. Stephen Collins has forsaken his consoles, Persis her turbans. While Paramount Pictures busily readies *Star Trek—The Motion Picture* for a gala December release, the two actors, now firmly entrenched in the 20th century, reflect on their celluloid excursion into future space.

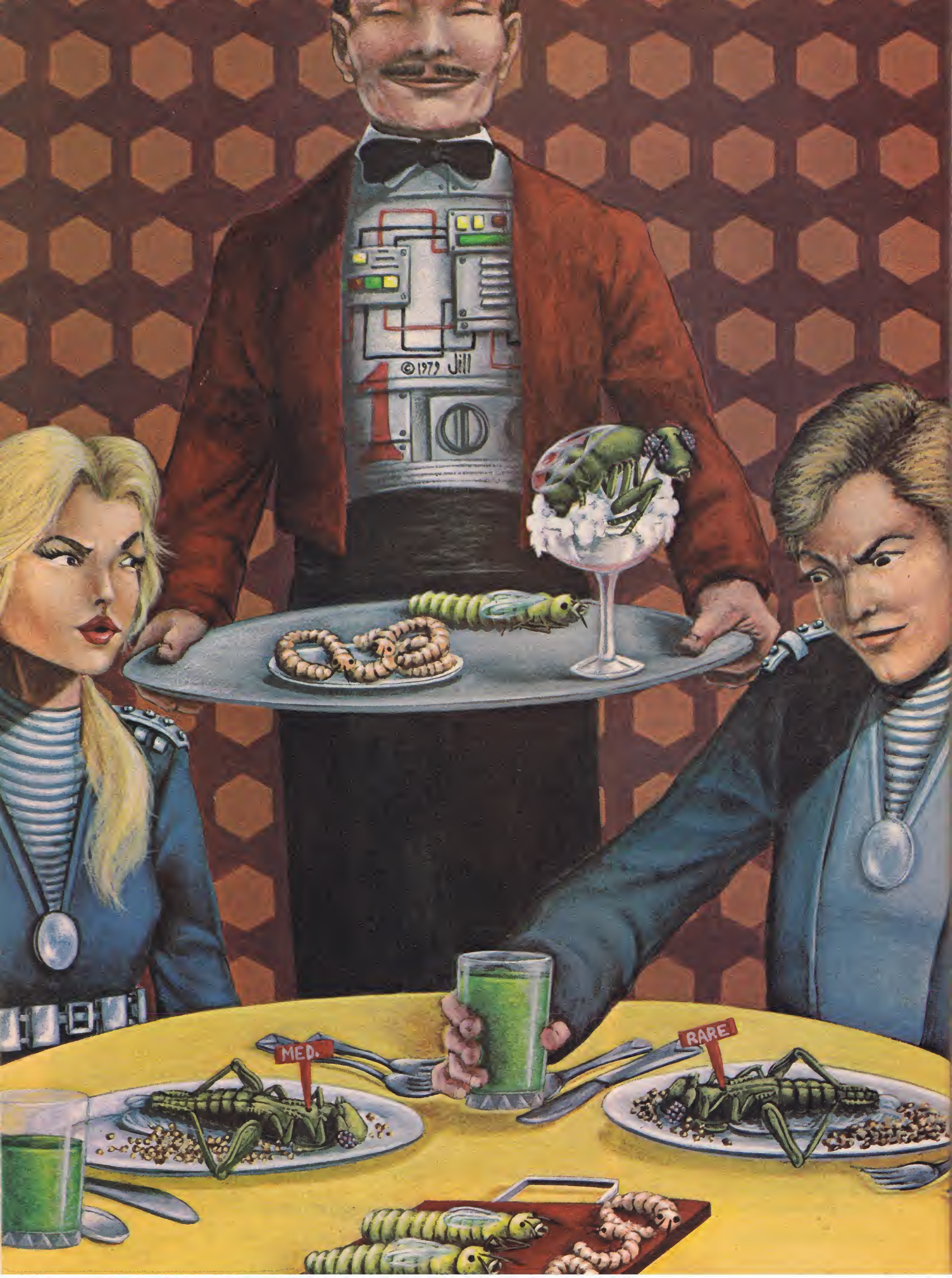
"It was a phenomenal period of time," smiles Collins. "Everyone was so *involved*. I think it will show on the screen, too. Despite all its science fiction trappings, the movie isn't an exercise in hardware. I think that people who have no interest in *Star Trek* whatsoever will love the movie. At the same time, I think fans of the TV show will also find it appealing. It's a movie about people, just like the old TV show was about people. And people are people. Our characters just happen to live a few centuries in the future."

Persis Khambatta echoes the feelings of her fellow *Enterprise* novice, adding, "I loved everything about the movie and I'd love to do a sequel. I was even very happy with the experience of being bald." She laughs ruefully, running a hand across her now more traditional hairline. "But I'm also very happy with the experience of my hair growing back."

Even a 23rd century citizen could empathize with that.



Persis Khambatta as Deltan crewmember Ilia.



Future FOOD

By NANCY NAGLIN

Today's Trash is Tomorrow's Tasty Treat

W

hen you sit down to dinner tonight with your porterhouse steak, baked potato and apple pie, consider this: Of the four billion people in the world, 1.5 billion are already underfed and .5 billion seriously malnourished. Every year there are 75 million more people to feed. Two out of every five children in the world who die before the age of six are now dying of malnutrition.

"Each year, the world consumes 1.2 billion metric tons of grain. This is equivalent to a highway 55 feet wide and six feet thick, built entirely of grain, and stretching around the Earth at the equator. Each year it is eaten and must be replaced. Each year expanding demand for food adds 625 more miles to it," says Dr. Norman Borlaug, who won a Nobel Peace Prize in 1970 for developing high-yield wheat.

Clearly, food is not an inexhaustible resource. In a future time there may well be museums where one can go to see, sample and smell the foods we take for granted now. According to Barbara Ford, author of *Future Food*, the meal of the future will feature whey sherry, hors d'oeuvres of crunchy crickets and sauteed mealworms, soy bread and cottonseed crisps, an algae entree and tofu fruit whip for dessert.

If this sounds a little far-fetched, protein-rich soybeans, a staple in hungrier areas of the world but used mainly as animal feed in the U.S., have been sold in supermarkets since 1973 as "meat extender." For every 100 pounds of fiber, the cotton plant produces 170 pounds of protein-rich seeds. Cotton-burgers—artificial hamburgers made of cottonseed extract mixed with bouillon and water—contain 90 percent protein and are already being marketed by the New Orleans Southern Regional Research Center.

Protein is the key to future food. In almost all parts of the world protein is derived from eating a combination of grains and legumes. In the U.S., as elsewhere in the industrialized, developed countries, enormous quantities of grain are fed to animals. In fact, in 1976 we Americans chomped through 192 pounds of meat per person as compared to only 55 pounds in 1940. During the same years poultry consumption jumped from 14 to 40 pounds. And although the flat farmlands of Illinois produce nearly three-quarters of the world's supply of soybeans,

most of it, including a third which is exported to Japan and western Europe for livestock feed, ends up as a cow's dinner.

If there's going to be enough food to go around at the end of the 21st century, we're going to have to change our diet. We will be eating pine cones, sawdust, microbes and food concocted in laboratories.

"To feed the world, we will have to make breakthroughs similar to those in other fields," says Dr. Mark Strahmann, professor of biochemistry at the University of Wisconsin. "Green leaves are the major source of protein and carbohydrates, but leaves have so much cellulose that only ruminant animals can digest them. To increase our food supply, we must learn to use the whole plant, including the leaves."

Bad news for people who don't like vegetables? Maybe not. Foods made from plant protein will probably bear no resemblance to leafy heads of lettuce or strands of parsley presently served draped over steaks.

Protein-rich parsley, spinach and kale are foods fit for humans in any form. But alfalfa, which contains more protein than any other leafy vegetable, has so much cellulose that it can only be digested by a multi-stomached creature. According to Dr. Strahmann, "An area a little bigger than Texas can supply enough alfalfa leaf protein to give every human presently living 35.2 grams of protein a day."

He has invented the first commercial amino acid analyzer—a refrigerator-sized machine which costs about \$60,000—to accurately determine protein content. Machinery at the University of Wisconsin ruptures the tough-fibered alfalfa cells and presses out a green juice that is 25 to 35 percent protein. When the juice is heated, it separates into curds and a clear brown liquid. The dried curds become a dark green powder called Leaf Protein Concentrate (LPC).

LPC may become a staple food that will not only feed the world but become as regular a part of our diet as peanut butter and crackers. Already, tasty LPC cookies have been made with alfalfa protein, whey, soy protein and wheat protein. They show acceptable color and nutrition, and a flour from the same ingredients can be the basis for breads, pasta, cereals and sausages. LPC has also been combined with cornmeal to form a crunchy

snack resembling a corn curl.

Existing farmlands don't have to be converted to LPC production. Dr. Strahmann estimates that in the U.S. over 21,000 million tons of plant wastes, containing 393,000 potential tons of protein, are thrown out annually. With his new machines, LPC plants may soon be as widespread as Wonder Bread factories.

Peanuts are tasty, addictive and almost 25 percent protein. Their high protein count makes them an ideal base for future foods. The lowly peanut has already been transformed into peanut-flake breakfast food. There are flavored peanut spreads which contain the peanut's protein but do not taste like peanut butter. In fact, some day they will taste like cheese, pâté or sausages. Defatted peanut flour is bland, which makes it ideal for fortifying bakery goods or as a base for a high-protein drink. A high-energy "space food stick" has been made from this defatted flour. And the defatted peanut—born when peanuts are pressed to remove the oil, then expanded in boiling water to their original shape and finally dried and roasted—are already being eaten in Carnation Breakfast Bars.

Typical of the new foods we can expect to be eating is "ricetein," a new blend of rice and soy protein containing the highest quality protein now available. It looks, tastes and is prepared like rice and will be marketed worldwide by Nabisco Inc. and Riviana Foods Inc. One three-quarter cup serving of cooked ricetein contains the same quality protein as one egg. The developers intend to market ricetein in the rice-consuming countries with nutritional deficiencies in the Middle East, Africa and Latin America. It will also be sold immediately to schools, hospitals and penal institutions in the U.S. While we still have our ribs and steaks, there will come a day when ricetein will be the major ingredient of chicken pilaf and stuffed cabbage.

Traditional research has tried to develop new strains of high-yield wheat. Dr. John W. Schmidt of the University of Nebraska has recently developed a strain of "super-wheat" called Lancota. This hybrid is formed from a high-protein wheat and two high-yield wheats. Average winter wheat in the U.S. produces about 13.3 percent protein. Lancota is 15.3 percent, all of it located in the endosperm—the part of the grain that is milled for white flour.

Of the world's total land area of 33 billion acres, 59 percent is desert, mountain, iced or salted. Only 18 percent can be used for food production, and of this, 11 percent is already under cultivation. Science may try to stretch the yield per acre. The world food shortage is so pressing, however, that new foods have to be found and invented.

A legume touted as the "soybean of the future" has been quietly growing to gigantic size in the isolated forests of New Guinea. The winged bean or *psophocarpus tetragonolobus* may be the potato-and-steak/rice-and-vegetable dinner of the future.

"Believe me," says Dr. Theodore Hymovitz of the University of Illinois, "the plant tastes good. The flowers taste like

mushrooms fried in oil. You can eat the whole thing like an ice cream cone."

Tetra is 34 to 37 percent protein—remarkably high, considering that a hamburger is only 22 percent protein. It contains 18 percent oil and the tuberous root, containing 20 to 24 percent protein, is also edible.

The plant routinely grows to 12 feet. It bears 50 to 60 pods from two to 14 inches long, each containing up to 20 seeds. The species requires a tropical humid climate, but already researchers have hopes of setting up tetra plantations in Hawaii, Florida and Puerto Rico. Tetra pops, tetra barbecue, even tetra instant soups may be the fast foods of tomorrow.

One day soon we will literally be eating microorganisms. Cheese, sour cream and yogurt are made with bacteria that can grow thousands of times faster than animals (which double in weight only every 30 to 60 days) or crops (which need seven to 14 days). Since some microorganisms can convert coal, oil and gas (hydrocarbons), a fraction of the crude oil now considered waste could be transformed into edible protein. For example, only two percent of the crude oil presently produced could yield 22 million tons of



Grasshoppers are on the menu. . . as are bee larvae.

protein. This is roughly equal to the total annual production of animal protein and is enough to supply one-third of the protein required for the entire world in the year 2000. Already, pigs and poultry have been fed this single-cell protein (SCP) with excellent results.

SCP, a general term for the alternative source of protein obtained from bacteria, fungi, yeasts and algae, is definitely the food of the future. It yields an unappetizing, tasteless powder that with flavoring and processing will be acceptable, even delicious.

One kind of bacteria, cellulomonas, grows on cellulose, which makes up one-third the weight of trees, vines, grasses and straw, including bagasse, a kind of gray hay. The U.S. alone produces 13 million tons of bagasse. With SCP technology, ten pounds of dry bagasse stalks yield four pounds of cellulomonas containing 50 to 55 percent protein.

The bagasse is chopped, mixed with water and put into a fermenter—a large, temperature-controlled tank. Cellulomonas is added. After four to six hours, when the enzymes have gone to work, the resulting soggy mass is sent to a settling tank. The liquid is removed, the cells dried and the SCP is ready to be used as animal feed.

What we throw out today we will be eating tomorrow. Blood, for example, from slaughter houses is usually diverted directly into sewage systems. Experimenters have found, however, that blood mixed with whey produces a nutritious "cheddar cheese." Likewise, when milk is made into cheese, it is first converted into curds and whey, and most of the whey is discarded. Each year 40 to 50 billion pounds of whey are dumped—and with it much of the nutrient value of milk.

In the oil exporting countries enough gas is uselessly flared off to produce twice as much nitrogen fertilizer as the world now produces. Urban sewage sludge mixed with sand makes rich soil. Of the three billion tons of urban solid wastes collected each year, one-half is cellulose-containing paper, which could be broken down into glucose, fermented and converted to cattle feed.

In the future, protein and oils from plant sources will be manufactured into analogs, which will be used to extend or even replace most of the meat and dairy products we now eat. Cheese made from vegetable oil and eaten with triticale cake, baked with flour from a hybrid of wheat and rye, will be standard fare at lunch counters.

The "farms" where these products will grow will also change. Fields will be redesigned to accommodate large, automated machines, which in some cases will ride on permanent tracks or rails to permit all-weather operation. Most of the mechanical operations—tillage, planting, harvesting—will be monitored and controlled by on-board computers.

Enclosed farming is already gaining a toe-hold. A large area is totally enclosed with a vast plastic bubble which regulates temperature, excludes weeds and pests, and conserves water, carbon dioxide and fertilizer. From a small base, this method is growing at a ten percent compound annual growth rate.

As fuel prices climb, industry is turning to "sun-dried" methods of drying crops. Instead of the centuries-old "spread-it-out-on-trays-in-the-sun" technique, food will be dried by flat-plate solar collectors and forced-circulation of hot air. The first big unit of this type is now being operated as a Department of Energy-financed demonstration plant at a soybean processing plant in Decatur, Alabama. The dryer, designed by the Solaron Corporation in Colorado, dries about 2,500 tons of soybeans a day and will save 28,000 gallons of fuel oil per year.

Remote sensing of agriculture by space satellite and ground computers will prove to be a practical way to safeguard crops already in the ground. Presently, two satellites, Landsat 1 and 2, orbit the Earth once every 18 days and record data via electronic sensors or multispectral scanners. Two wavelength bands measure visible light radiation and two others measure infrared and ultraviolet radiation. The wavelength of sensed radiation will show plant type, maturity and overall condition, which makes it possible to determine what crop is being grown, its quantity, maturity and condition. The satellites also provide data on soil class-

ification, crop yield, and water supply and demand. In one experiment in California's Imperial Valley, Landsat 1 inventoried more than 25 separate crops in 8,865 fields spread out over 458,800 acres.

World-wide surveys will help formulate a global food policy. It will be possible to predict how much wheat, corn or soybeans is being grown and where. If a drought is moving across the summer wheatfields of Argentina, for example, farmers in Kansas and Oklahoma will be alerted to plant a larger spring crop to offset the losses.


As our food supply is strained, we may finally have to seek nourishment from the insect life that once nurtured the Indians and still supplements the diet of some primitive peoples. Grasshoppers are 60 percent protein as compared to the 43 percent protein content of dried beef round.

Carol Miller, a 27-year-old home economist who studied at California State University in San Luis Obispo, has devised tasty recipes for eating insects. She and her husband regularly sit down to a dinner of termite pilaf. Grasshoppers are on the menu, too, as are bee larvae served as crunchy croutons scattered over salads.

"Insect tissues are a very high source of protein, much higher than beef or any other proteins we normally eat," says Dr. Roy Snelling, entomologist at the Los Angeles Museum of Natural History.

"I don't care much for cockroaches," he concedes. "They have a peculiar taste. So do crickets. But freshly roasted grasshoppers are quite edible. I collect them myself and keep them alive for three or four days and feed them on corn meal. That takes out any bitter flavor they may have from eating alfalfa or other grasses. It's sort of like corn-fed beef. To cook them, I put a little oil in a skillet, brown the insect up good, put a cover on the skillet and let them simmer for 20 minutes or so. They're absolutely delicious."

If french-fried flies never catch on in America the way ice cream, diet drinks and french fries have, then they will, at least, along with other insects become a nutritious food for livestock. Nevertheless, the day will come when we may have to rely on pills to supply all the nutrients to maintain ideal weight and tissue development. They will be ideal for journeys into outer space or under the sea—and for people for whom even now it is a bother to prepare food.

Considering the critical food shortage, it is not impossible to imagine that savoring food—cooking and enjoying it for its own sake—may become a thing of the past. There may even be routine rationing of "real foods," which people will be allowed to eat only one month out of the year. The rest of the time we will have to be content with synthetic foods, made from natural or chemical bases or a steady diet of pills, fortified liquids or pastes. More likely, however, is the not too depressing likelihood that the future-time Julia Childs will be showing us how to prepare tasty meals of fresh duckweed, cheese analog casserole, tritacale cakes and peanut-based "sausages." Bon appetit! 

Future Dreams on Public TV

(continued from page 31)

pop-eyed monsters and screaming maidens. I think it's about time science fiction films caught up... showed a little real thought and a little real feeling."

Le Guin doesn't mind referring to *Lathe* as a science fiction story but adds that this label might be misleading. "A lot of people see science fiction as the 'look out, don't do that' strain of fiction," says the author. "People are going to look for the *message* of this show. I hate to use the word *message* because you make the whole thing sound like a fortune cookie. We struggled not to make this show too heavy. Not to make it too serious. I think that both the book and the movie make a point but it's not an easy one to boil down to one sentence. We definitely say something in the movie but you have to figure out what it is. You have to come to the conclusion. I guess you *could* say it's about dreams and nightmares. Let's say it's about what happens when the American dream becomes the American nightmare. When will this happen? Who will it happen to? That's not exactly a message, yet in another sense, it is."

Producer Loxton is loathe to label the show anything more than a "drama." "I would like them to be intrigued on an intellectual level. It's as Ursula says in the introduction to *The Left Hand of Darkness*: 'We're not saying this is the way the future is going to be. That would be pessimistic.' We're simply saying that if *this* happens, then *that* could happen as a result. You should come into this work with an open sense of curiosity."

"I think this is a new kind of drama for Public Television. America is really steeped in representational reality in commercial TV. Everyone thinks that action-adventure series are the only kind of drama that is viable for TV. *Lathe* isn't like that at all. It's an allegory. It's a parable. It's a 'what if' drama. It's an experiment in what I believe is right for television. I think you can create good fantasy on television. Television is, after all, a fantasy medium."


But it is actor Conway who sums up the most practical benefits of the union between PBS and speculative fiction. "I thank god this show is on public television," he stresses. "If this was on network TV, we'd never have gotten away with the quality of the script. Because it is on PBS, there's a certain connotation of quality that goes with the production. The nice thing about PBS is that they film it the way they want to film it. They show it when they want to show it. And, if seven people watch it, they think it's just fine. They've just shown an intelligent show to seven intelligent people and no one has to worry about being fired because of it."

Future Dreams

With *The Lathe of Heaven* now slated as a January of 1980 presentation, Loxton is now turning his attention to the shape of speculative fiction to come on public televi-

sion. "We really want to get this series concept going," he says. "We've done some research on the project already, but we need more money. Hopefully, when people see the finished *Lathe of Heaven*, we'll be able to get funds to develop the series. It should take us six months or less to come up with a list of writers and novels that are both interested and interesting. From that point, it could take us anywhere from one to three years to get on the air. The earliest air date for the series would be 1982, a 13-episode program. I think that, so far, our timing has proven perfect about speculative fiction on television."

"I'm predicting that movies like *Alien* will gross out audiences to the point where, in the 1980s, there will be a demand for intellectual speculative fiction presentation. Certainly in terms of literature, there has been a demand for that for quite some time. But, from a television viewpoint, I think that the 1980s will be the decade for intelligent speculative fiction. People will want thought-provoking shows, interesting shows."

Loxton relaxes in his office, surrounded by memorabilia; testimony to the Television Lab's determination to launch such quality productions as *The Police Tapes*, *Making Television Dance* and *Bad Boys*. The Lab's proposed speculative fiction series will require a lot more money and a lot more time. The producer and his staff are willing to sacrifice in order to ensnare both. And when the money and the time does appear, what type of novels would David Loxton like to see on PBS? "Well," he replies with wistful smile, "I'd love to do *The Left Hand of Darkness*..." 

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We'd Rather Be Alone™

Dosuk Lee

A young scientist captures fantastic vistas
and tiny spacescapes seen through microscopes



On weekends, Dosuk Lee scans through space photographing colorful images. The alien worlds he visits are found through the microscopes in the Cornell University's Department of Chemical Engineering.

"I took these pictures because I wanted to share an experience," says the 22-year-old graduate student, who is known as Duke. "You know how the ocean divers say it's another world down there? This is the same thing."

As a serious student of chemical microscopy, Duke is quick to point out that these pictures do not represent the usual work of a chemical microscopist. "If I took these to a scientific journal, they would laugh," he ex-

plains. "This is not what we do all the time. This is one of those things, you go in Saturday morning and take pictures, forget about the time..."

Taking pictures through the microscope—photomicroscopy—is just a small corner of the field Dosuk Lee has chosen for his specialty. As a chemical microscopist, he is learning how best to use the microscope in the analysis of chemical compounds. Most people think of the microscope as a tool used for biology, but it is also important to the field of physical science.

"Chemical microscopy is a very specialized field," says Duke. "Cornell is the only university that offers a graduate level program. To be in chemical microscopy, you first have to learn how to use the microscope properly."

"You can ask a lot of people if they know how to use a microscope, and they'll say yes. But that's not exactly true. It takes a long time to know how to use a microscope properly. You have to learn about optics, how light works; a little bit of physics. You have to learn how to get the optimum information from a specimen."

"Photomicroscopy is an important corner of the field, because you have to record what you see."

Photomicroscopy, it seems, can also be enjoyed as an art form. Duke first became interested in his weekend hobby when, as an undergraduate science student, he joined an independent study course organized for students with both science and photography backgrounds. He's been taking pictures since

Above: Duke Lee with microscope. Opposite: The painted cliffs of another world are actually recrystallized adipic acid in organic solvent, double exposed.



Right: Dissolved gelatin photographed under a Nomarski interference microscope provided the right conditions for this vista of a molten golden path.

Below: Resembling a Japanese woodcut of a wave, the photo was produced by recrystallizing a carbon tetrabromide and benzidine melt in n-amyl alcohol; moon is a double exposure.

Bottom: This underwater scene is actually the surface of a glass edge taken under a Nomarski interference microscope with a color filter positioned at an oblique angle.

Bottom, right: A Bonestellesque spacescape is a recrystallized acetotoluidine melt dissolved in organic solvent and photographed under a cross polarized microscope; the moon-shape is the result of a double exposure.



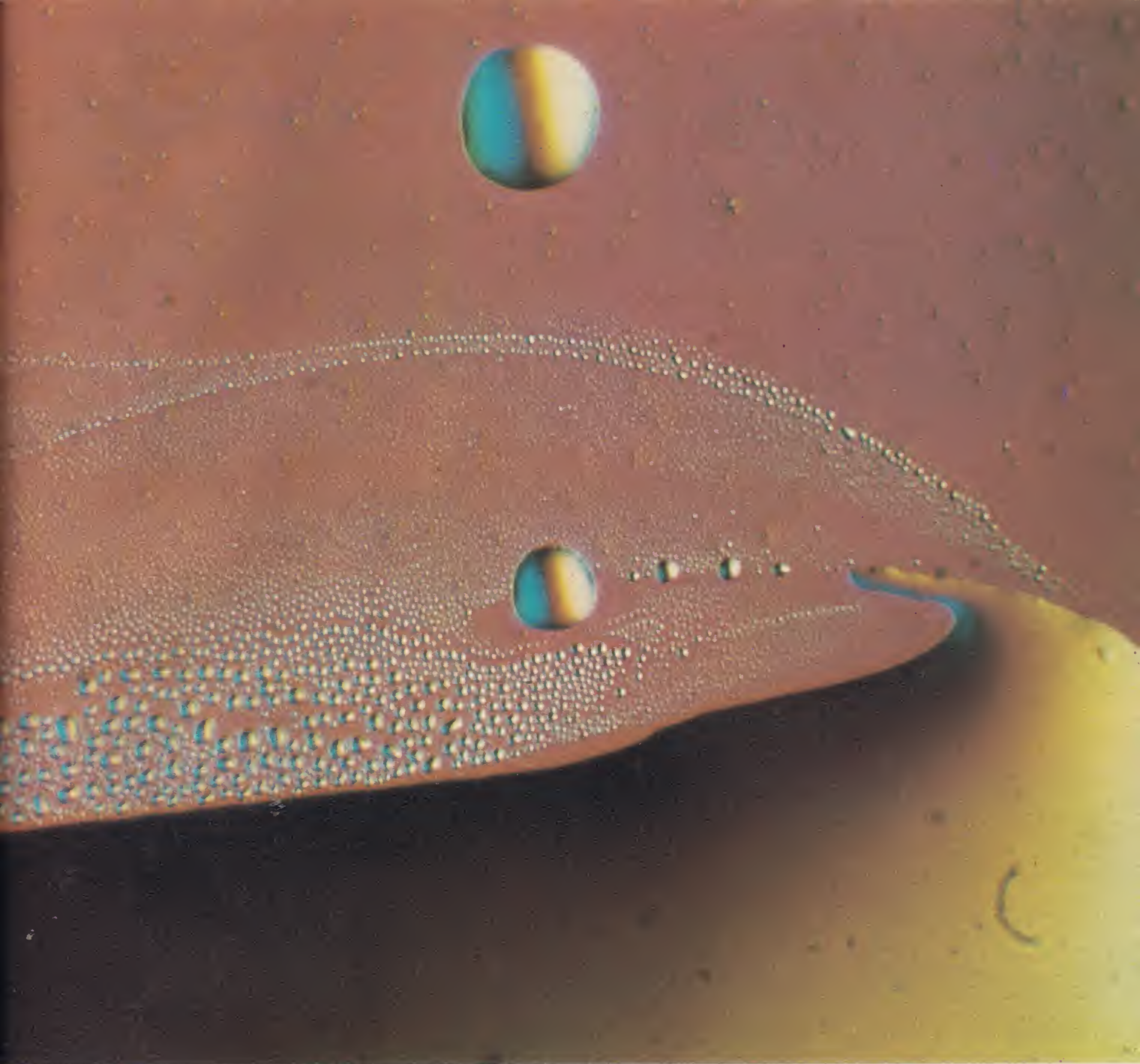
PHOTOS © 1979 DOBUEK LEE



he was about 13, so photomicroscopy immediately appealed to him. These days, as a first year graduate student, most of his time is devoted to course work at Cornell. But he can't resist spending part of his weekends experimenting with the variety of microscopes available in the Cornell lab where he works.

"Maybe it's in my character that I like to look at little things," he says. "I want to see what's going on. I like to find nitty gritty things that people don't usually see, and I want to show it. It's not every day that you walk down the street and see images like these, so I record them and share them."

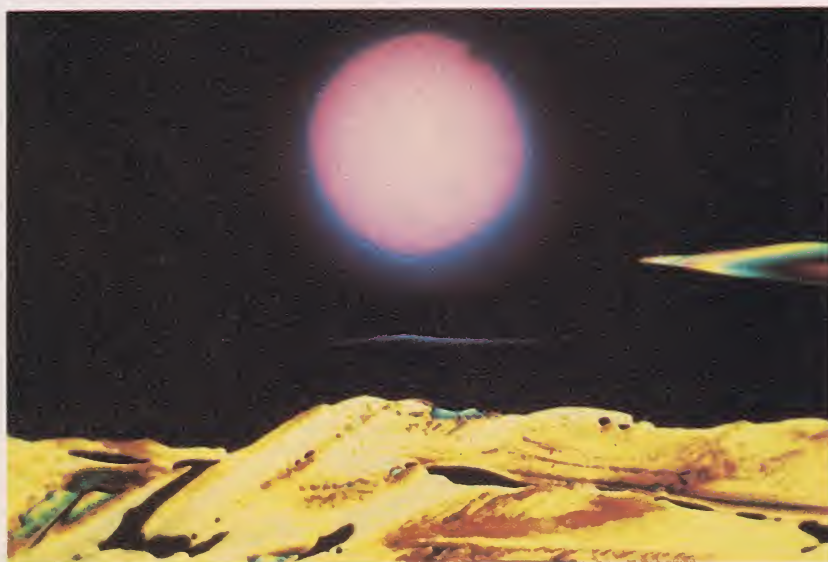
Getting pictures like these involves a bit more than just clicking a camera hooked up to a microscope. First he prepares the specimens, purposely growing crystals in abnormal patterns. He uses organic acids for

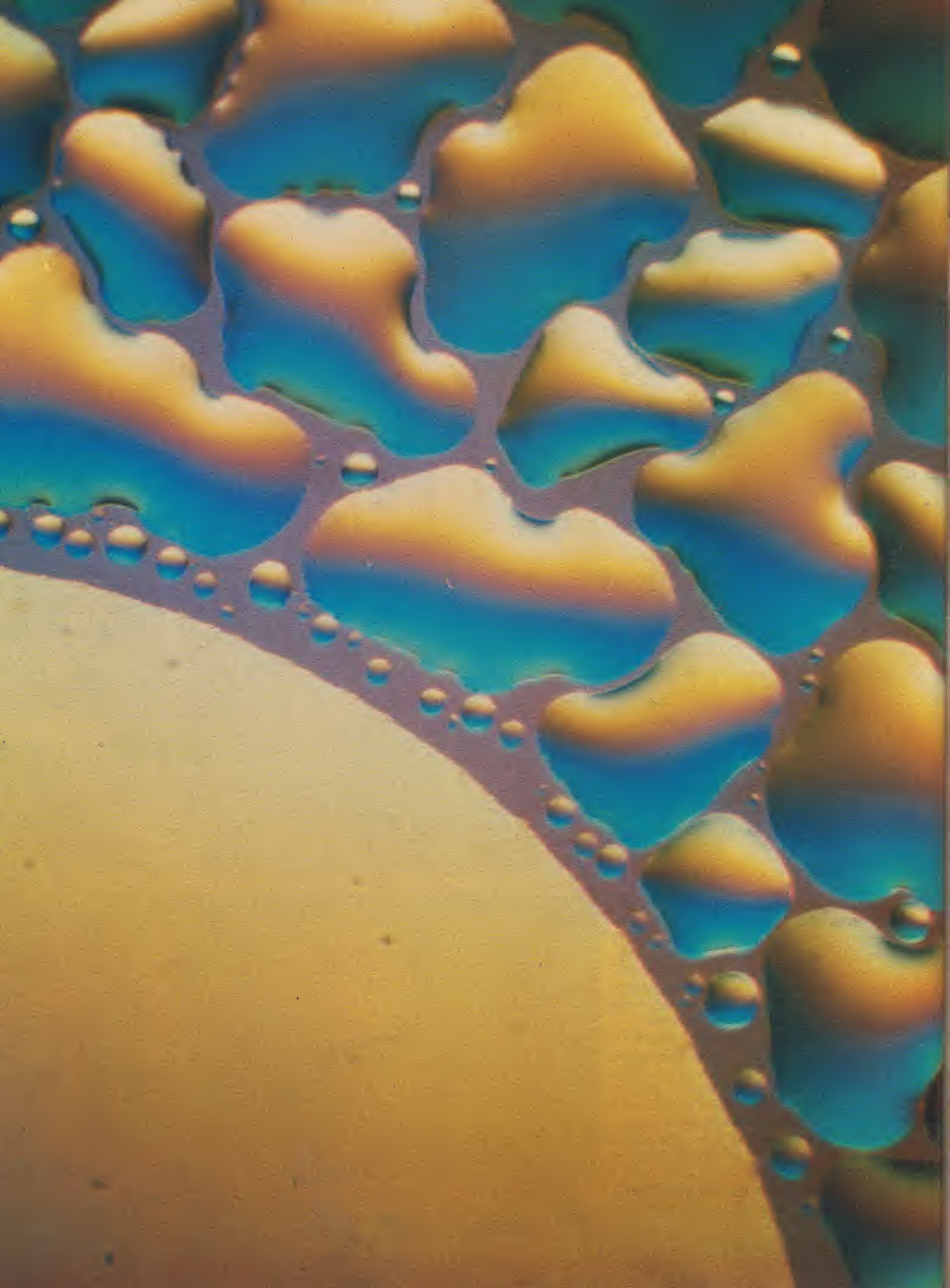


the most part, because they provide the most photogenic subjects in terms of color, contrast and shapes. Next he decides what type of microscope is best suited for the specimen he's photographing. Most of the photos reproduced here were taken through a polarizing microscope; the ones using water were taken with an interference microscope.

The final pictures are framed and excerpted from a much larger field visible through the microscope. He moves the frame around in the field and positions it at the angle he wants, to produce the image he selects. Sometimes he adds dying suns or iridescent moons in the skies of his crystal landscapes by manipulating the microscope for a double exposure.

"You can play around with the photography some," says Duke, "but these are the





real colors and shapes that I see. In fact, the color is even more saturated under the microscope than in the pictures."

His working knowledge of the microscope is essential to the success of his pictures, as is illustrated by an experience he had with a class of photographers at Cornell. "The professor asked me to present my pictures to his class and afterwards all these people came up to me and said 'I want to produce those pictures.' A bunch of them came over to the lab and it turned out to be more difficult than they thought. I could give them a premounted slide, but even that doesn't work too well because it's kind of difficult to use a microscope. And it's really more playing around with the microscope than with the camera. So it was kind of disappointing, for me and for these people, who kind of faded away and didn't show up again.

"Once you find the image, anybody can take the picture. But first you have to find the image."

The microscopic scenes Duke records range from abstract compositions to nearly representational landscapes.

"I took some of them thinking that they looked like space scenes. It's kind of funny, because out there is so big, and down there is so little. But there are so many things to see, a lot of different worlds. Not all of them are planets or outer space, but they all have some kind of image that I wanted to make. I think I lean toward thinking a little bit aesthetically," he says almost apologetically, as if an aesthetic sense is not a particularly desirable quality for a scientist.

"An artist could look at these and say that they are pretty pictures. A chemical microscopist or crystallographer could look at them and explain how I got these particular colors and shapes. But they would also say that they have no value except aesthetically."

Since he's studying to be a scientist, Duke is a bit cautious about his artistic dabblings with the microscope.

"I would like to make people realize that microscopy is a very, very important practice, essential to the fields of biology and chemistry. In the future, I think I'd like to teach microscopy, and I want to keep learning myself. There will always be more to learn because the field is so complex."

And as long as he has access to a variety of sophisticated microscopes, Duke Lee will probably be taking pretty pictures on weekends.

"I've always had an interest in art. Maybe if somebody told me I was going to be another Picasso, maybe I would take this more seriously. But I don't think my parents brought me all the way from Korea just to be an artist who is wondering where his next meal will come from.

"In America, if you really want something and you work real hard, you get it, right? So, I'm doing two things," says the young scientist/artist. "One is for a purpose, and one is for enjoyment."

A bizarre cloudscape was produced by photographing simple water vapor under a Nomarski interference microscope.

Meteor

(continued from page 47)

could happen again.

Most of the Earth-approaching asteroids—the prime candidates for disastrous collisions—have been discovered by accident. Now that astronomers are searching, they find more every year. One called Hermes made the closest recorded pass by Earth in 1937, zooming by half a million miles away, a distance only twice as far away as the Moon. It has failed to reappear on schedule and is now considered lost. Another, Icarus, passed by in 1968 at the uncomfortable cosmic distance of four million miles.

In 1967, an ingenious professor at the Massachusetts Institute of Technology used Icarus as the springboard for a novel course in space systems engineering. His premise: Icarus is on collision course with Earth, moving at a velocity of 100,000 feet per second and due to arrive in 18 months. The students' problem: Using existing technology, is it possible to prevent the global disaster that would result from the collision?

Prof. Paul Sandorff's students, in their report called Project Icarus, determined that Saturn V rockets armed with nuclear warheads might be able to deflect the asteroid from a collision course—or at least break it up into smaller pieces, which would be more likely to vaporize upon entering Earth's atmosphere.

Project Icarus inspired the plot of the film *Meteor*—with an added political twist. In the film, the destruction of the asteroid depends on the cooperation of the U.S. and the U.S.S.R. The assumption is that both superpowers have armed nuclear warheads stationed in orbit—and aimed at each other. Will they admit it in time to join forces against the cosmic invader?

Nuclear bombs in military space bases—science fiction or science fact?

Only the generals know for sure, but if there are such things out there, they are in flagrant disregard of a handful of treaties. Technologically, it's certainly not beyond the realm of science fact. Politically, it would be a tough situation to keep quiet. Optical and radio observatories around the world would have to be in on the conspiracy, an unlikely possibility.

If the world had 18 months to prepare for such a cosmic attack, maybe something could be rigged up—although Saturn V rockets are not as readily available today as they were in the heat of the Moon landing effort. With only six days warning (the case in *Meteor*), we'd be out of luck.

So the rescue scenario is one element of the film that qualifies as science fiction.

What could be done if, in the near future, astronomers sighted a mile-wide asteroid rushing toward a catastrophic collision with Earth? Not much. But some scientists want to develop the technology to get them before they get us.

Proponents of space industrialization have their own reasons for wanting to capture asteroids and divert them from their natural



Neame directs actor Bo Brundin during the crucial Hercules-Peter the Great missile launch scene towards the movie's finale.

courses. They're not as concerned about potential collisions as they are simply interested in the material resources to be mined from asteroids. But if we had the technology to round up an asteroid and position it into orbit around Earth (where it could be mined for water, metals and carbon compounds to build space habitats and solar power satellites), that same technology could also be employed to nudge a space mountain away from a potentially catastrophic meeting with the citizens of Earth.

How do you convince an asteroid to change direction? If you've got enough of a head start, you simply attach any variety of propulsion system—an ion drive, a mass-driver mechanism, standard chemical rockets or a pulsed nuclear engine—to the asteroid, then point it where you want it to go. With a portable chemical processing plant (such as those now being devised for processing Moon dirt), you could even manufacture propellant fuel from raw materials at the asteroid. Other ideas include using gravity assists by routing the asteroid around the Moon, Venus or Mars to add velocity, and one scientist has suggested moving one large asteroid by bombarding it with debris from a smaller asteroid in a kind of cosmic billiards ploy. Whatever the method, asteroid miners are currently studying the best ways to lasso the big rocks for big building projects in outer space.

All the asteroid capture and retrieval systems would take several years of hardware development before they could be put into action. But once operable, they would serve two purposes. In the event of imminent collision, industrial asteroid catchers could defend the Earth against unwelcome cosmic visitors. And if it looks like the coast is clear, the same machinery could be used to tow resource-rich space rocks back to be mined for the use of people living on Earth and in space.

One final note about the "science fiction-science fact" quibble: If science fiction can be loosely defined as a story that takes place in the future, *Meteor* is straight science fiction. When Earth scientists want an on-site inspection of the debris heading their way, they simply reroute a manned U.S. space mission, *Challenger*, to take a look.

That couldn't happen today.

—Robin Snelson

STARLOG TRADING POST

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Issue #3 (December) Special-effects issue, combination color landscape and SPACE: 1999 Eagle blueprint poster, SF GRAPHICS catalog.
Issue #4 (February) Supermarionation issue, (2) color gate-fold posters of future cities, X-Wing Fighter blueprints, Godzilla.
Issue #5 (March) Superman special, In-Flight poster, international comic art, SPACESHIPS preview.
Issue #6 (April) Wonder Woman in Giant Poster, Japanese Monster Guide, SF art, Japanese history of robots.
Issue #7 (May) Science-Fiction Review. Much original Japanese SF art, photos—never before published in U.S. Forry Ackerman souvenirs, color photo collages and posters.
Issue #8 (June) Superman Section—the complete movie story, SF puzzles & mazes, Chris Foss fold-out, Star Trek animation.
Issue #9 (July) Alien preview and poster, Gum Card Collectors Section, SPACE ART, Roger Dean fantasy art, Behind-scenes of Japanese movie productions.
Issue #10 (August) Fantasy special, comic book art poster, space fashion, fantastic color art section.
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No. 3



No. 4



No. 5



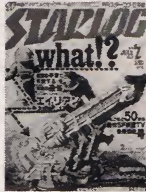
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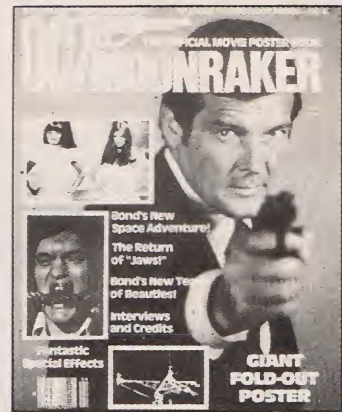


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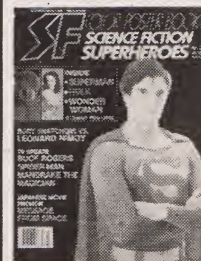
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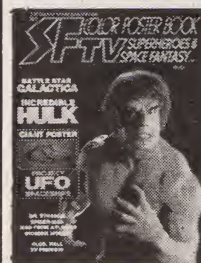
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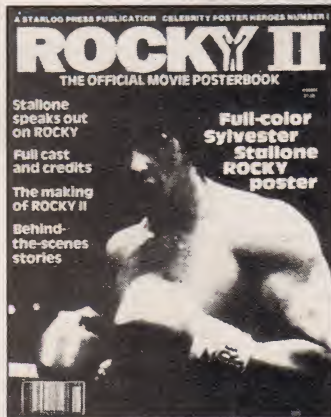


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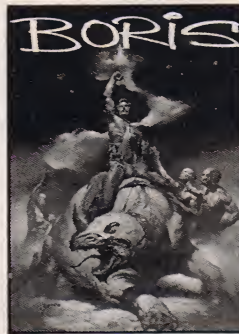
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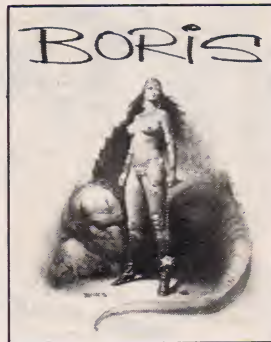
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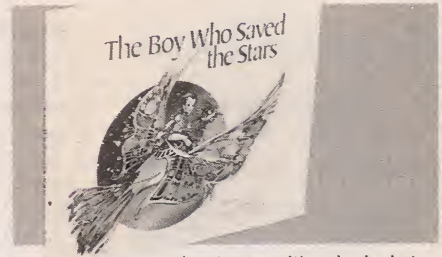
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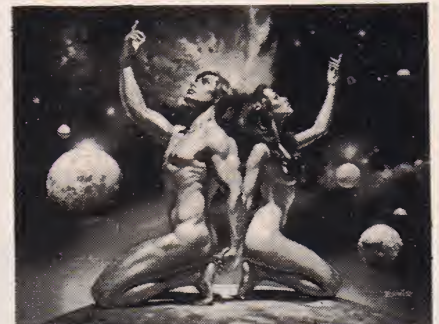


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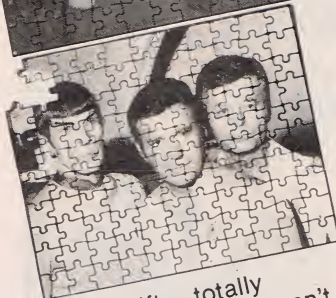
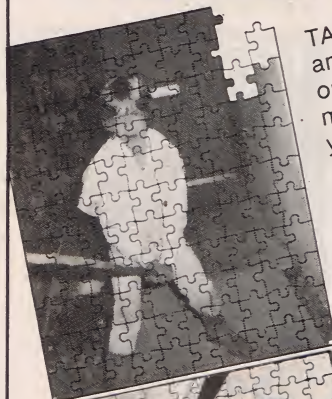
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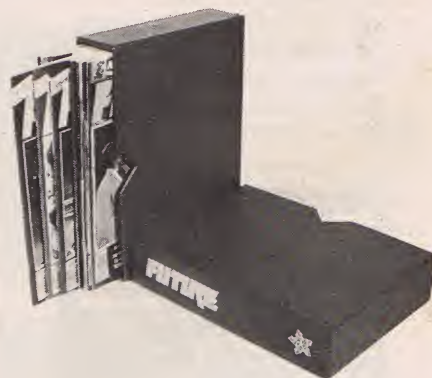
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New Sources of Energy

It's all going to run out in about 20 years. The last oil well will glug out its final black drop then go dry. The empty hoses will hang limply from the gas pumps and all the cars will stop moving. All gone, used up, finished.

Of course it won't happen just like that. As the price of gas goes up consumption will have to go down. The private car will be as dead as the dodo and our kids will go look at them in museums. The dwindling reserves of oil will be used for vital chemicals and hoarded by the military. Life won't be too good...

That's the usual scenario, made familiar by a thousand science fiction stories, including a few by yours truly. But does it have to be that way? Not necessarily. The politicians have not caught wise yet to the possibility of a coming disaster, but the conservation groups know and are putting on the squeeze. All that is really needed is the will—if we have that we can do it. A small percentage of our grossly inflated military budget would cover the research and development of what are being called alternative energy sources. But what exactly are they?

By HARRY HARRISON

Harry Harrison is one of the most popular science fiction writers in print today. The author of the vintage Deathworld trilogy, Harrison is also the creator of "Slippery Jim diGriz," the "star" of the infamous Stainless Steel Rat series. A writer who often mixes a keen sense of humor with a sharp sense of science, he has also penned such novels as Make Room! Make Room! (later filmed as Soylent Green), The California Iceberg (a tale of iceberg towing), The Technicolor Time Machine (the ultimate Hollywood SF satire) and Skyfall (a pre-Skylab disaster-from-the-skies thriller). Connecticut-born Harrison currently resides in Ireland with his family.

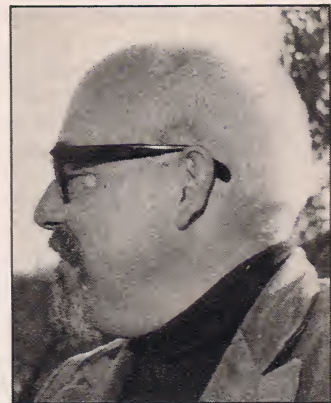
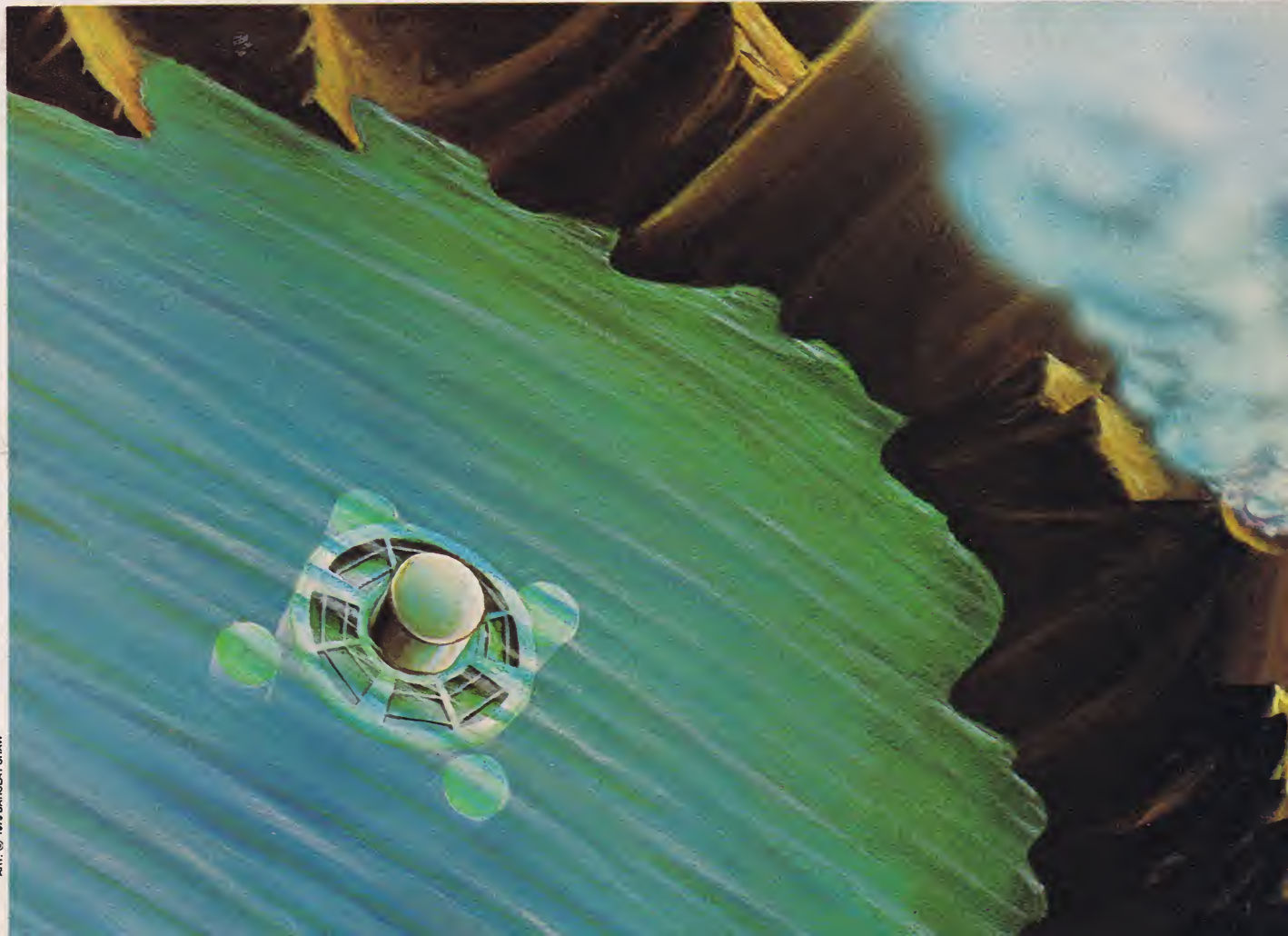


PHOTO: CHRIS LOVE

Putting nuclear fusion aside for the moment—if we had it all our problems would be solved; but we don't have it—we turn to the Big Source itself. The sun. The energy in coal and oil is trapped sunlight, as is hydroelectric power. There are two ways of directly tapping this eternal source; on Earth and in space.

Let's take the Earth first. The sun radiates light energy that hits our atmosphere and heats it up—causing winds to blow. Winds move waves—and there is our energy free for the taking. We can tap sunlight directly with

solar cells that generate electricity, but they are expensive. We can move one notch away and utilize the wind, but windmills are also pricey per unit of electricity generated. Or we can turn to the oceans. Anyone who has ever been knocked down by a wave will have some idea of the power of the sea. A number of different kind of wave-generators are now being developed. Some of them utilize the rising and falling of the waves to compress air in a column and use this to power a generator. Others harness the oscillation of the waves—the "wave" of the waves—to rock a



cylinder back and forth. This rocking motion either compresses a liquid which drives a generator, or through cam action the rocking itself turns the generator.

Wave energy is free for the taking—and it is time we took it. The electricity generated in this manner can be fed right into the power grid system that already covers the nation. It can be augmented by wind-generated electricity—new and more powerful windmill designs are being tested—and by solar cells in the sunny areas. If this still does not meet our energy needs we must look to space where the solar energy is limitless and constant.

There is always someone ready to sneer at the new ideas—simply because they are new. (It wasn't that long ago that the Astronomer Royal of Great Britain thought that the idea of space travel was "poppycock.") What was thought to be a screwball idea just a few years ago is now the subject of an official \$25 million study. This is the generation of electricity in space. A large mirror of thin plastic will be assembled in space at the height of 22,300 miles. This is a geostationary orbit, meaning that it will apparently be suspended in space over the same spot on the Earth below. The never-ending sunlight will be reflected by the mirror to a focus to heat a liquid. This will drive a generator to produce electricity. Since it would be a little difficult to drop a cable down to the ground, the electricity would be converted in turn to

microwave radiation which would be beamed down to Earth. (Not the weak radio waves that you pick up on your transistor, but stronger like those that heat up dinner in a microwave oven.) Antenna fields on the Earth below will receive the radio waves and turn them back into electricity. Simple, clean, free, non-polluting—and eternal.

But the sneerers are already sneering at these energy sources. "Solar cells cost too much." They certainly do—but as research

few years more than predicted, but the end result will be the same. All gone. Nor can we go on burning them up, not even now. Petroleum is the basis of the chemical industry, it is needed for fertilizer, for drugs, for plastics. Burning this irreplaceable resource simply to generate energy is like stoking a fire with ten dollar bills. It's madness. Properly used, we have enough petroleum for generations to come. It is *now* that the alternative energy forms must be generated.

"It is now that alternative energy forms must be generated. Plant life is an obvious source; our forests must be planted and cropped on a regular basis."

proceeds the unit cost will surely come down. "Windmills aren't practical on a large scale." Yet all of the Netherlands were pumped dry and turned into farmland by *wooden* windmills. And then there is the one I like best of all. "If you build metal wave-generating equipment it will just rust and corrode away." Oh, will it? Why not tell that to the captains of all the steel ships that merrily cruise the seas.

The voices of despair have to be ignored. Fossil fuels are running out—and that fact cannot be ignored. Perhaps they will last a

Until we get fusion power—if we ever do—we must develop many other forms of energy supply, since no single one will replace petroleum. Plant life is an obvious source; our forests must be planted and cropped on a regular basis. Alcohol can be distilled from most vegetable products and waste, including grass. It doesn't contain as much energy per unit of volume as gasoline does, but you can run an internal combustion engine with it. Perhaps the farmer of the future will keep a certain number of acres under grass to power his farm equipment.



With an abundance of electricity we can begin moving into the hydrogen economy. As every high school student knows, you can split water into hydrogen and oxygen by pumping in electricity. The oxygen has a number of uses while the hydrogen can be liquified and put into the auto tanks. It is a non-polluting fuel, too, since when it burns the exhaust consists of . . . water!

The family buggy will be on the way out very soon, so we might as well get used to the idea. Public transportation which can utilize electricity directly will be a must. There will still be a need for individual vehicles, ambulances, fire engines and such, so we can look forward to some interesting developments. They may burn alcohol, hydrogen, gasoline made from shale—or be powered by batteries or even by large flywheels. The flywheel will be run up to speed during the night by plugging it into a wall socket. In the morning the throw of a switch converts the flywheel motor into a generator to drive electric motors in each wheel. The wheels will be fixed and steering will be controlled by the car's minicomputer, which will speed wheels up or slow them down—just as track-speed steers a tank or tractor.

Of course we can louse up the whole thing by doing too little too late, waiting until the petroleum is gone before doing anything about alternate energy sources. Ten years ago

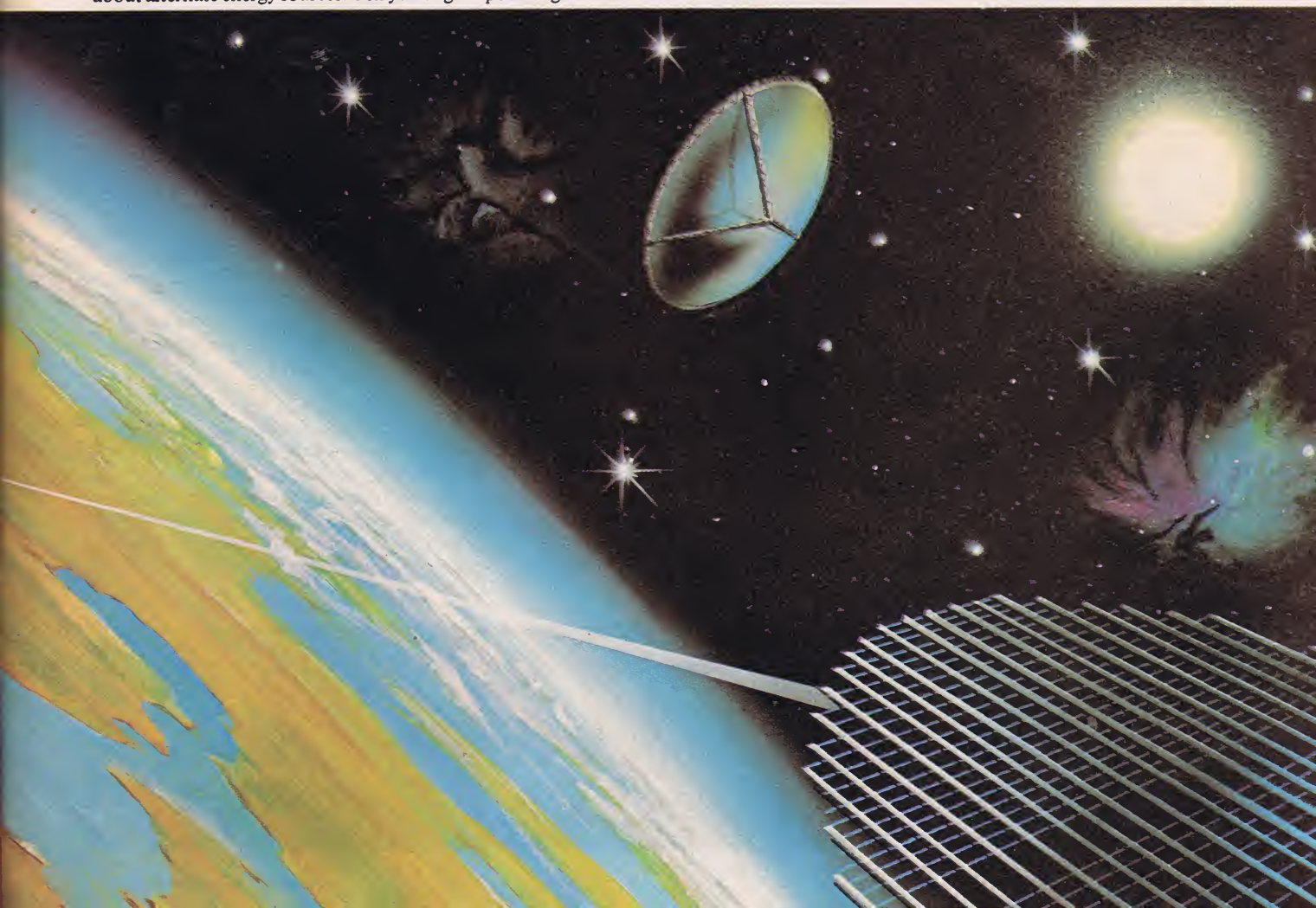
it looked like that was just what was going to happen. But opinions have changed. Conservation groups around the world have grown and prospered. The politicians are beginning to listen. If we can *make* them listen, force them to control the wild population growth that is consuming irreplaceable resources, to control the pollution that is poisoning the environment—the only one we will ever have here on Earth—to develop alternate energy sources before it is too late, if we can make them do that we could have as close to a paradise on Earth as is physically possible. If we do get it right—this is the kind of world that we, and our children, will be living in:

The day will begin like any other day. Food will be plentiful, though there will be less meat around. (It takes ten pounds of vegetable protein to produce one pound of animal protein. If we eat the vegetable instead we will use one-tenth the fertilizer, land and energy of a meat eater.) All of the usual electrically powered items will be in the house: refrigerator, stove, TV, air-conditioner—the lot. It is only when we leave the house that a change will be obvious. The streets will be free of pollution and will be quiet, almost empty of vehicles. The garage behind the house will have been turned into a greenhouse. There will be a lot of bicycles sweeping by, on their own paths between the sidewalks and the road. They are healthy, practical and non-polluting. Some of us will have to travel

longer distances and *successful* public transport will take care of that. It is the shame of America that we have allowed our public transport to decay and vanish while we worshipped at the Cult of the Car. The Europeans, who were late in catching the car mania, can show us the way. There will be silent and smooth trolley trains as in Amsterdam or Copenhagen. Fast clean subway cars, as in London or Moscow, will take us to work. Electrical buses will service the outlying suburbs. Trains traveling 150 mph will connect the cities. We will still move on wheels—though we will have to forego the pleasure of driving ourselves.

Factories and offices will be electrified, as will the farms. However there will no longer be any need for many of us to go to the office. The age of the microcomputer will take care of that. The salesman will talk to his clients on the picturephone, hook his terminal into their computer to find out their stock needs, settle the order and transfer the information to his firm for shipment—and deduct the billing from his client's account.

The writers, solitary types in any case, will wallow in even more solitude. A phone call to editor or producer will settle the details of the assignment. The writer will use his personal computer to "type" the copy onto a screen where it can be corrected and edited. Hard copy, typed on paper, won't be needed at all. When the article or story or script is ready a



phone call will transfer the work to the memory of the editor's computer. After the agreed changes have been made—again by transferring information back and forth over the phone lines—the final copy will be sent by phone to the memory of the photo-typesetter, where it will appear in print for the first time. Perfect and final.

With a little effort life will not be the same as today—it will be better. We will have to learn to accommodate to a no-growth, stable economy. The slowly vanishing reserves of fossil fuels will only be used for their chemical content, not their energy. Our energy needs will be supplied by solar power, generated both in space and by solar panels on Earth, along with water power, wave and wind power, and vegetable fuel sources. Fusion would help, but we can't count on it for certain. Atomic energy will be phased out as soon as possible. The accident at the Three Mile Island generator was predicted by the conservationists—and ignored. You can't ignore it now. Nuclear energy is unreliable, costly, dangerous, polluting and poisonous to the world for thousands of years to come. It will be phased out.

It has been said that faith can move mountains. It can. Faith that these alternate energy resources can supply our needs, stabilize our peaceful world and give us a full life is all that we need. The technical knowledge is there. Let's apply it. Let us not misapply it—with ecological and economic disasters like *Concorde*—but put it to work for us. A diversion of only a small percentage of the world's armament budgets would supply all the money needed. And we are going to have to do it. It is only a few minutes to midnight. Before the clock strikes we are going to have to decide if we want to live in a world at peace—or watch the entire thing go down the drain. We are going to have to forget nationalism, remember that we are all passengers on spaceship Earth—and act accordingly. The alternative is unthinkable.

The time to act is now.



next issue



LOOKING FORWARD TO THE '80s

The 1970s are drawing to a close and soon planet Earth will have a new decade to contend with. But what will the near future bring? In a special "Information for the 80s" section of our next issue, *FUTURE LIFE* will forecast some of the most likely things to come in the worlds of medicine, transportation and lifestyles. Plus: An in-depth look at the upcoming electronic age. The advent of two-way television. A home computer buying guide for the future-minded. An examination of "The Source": the ultimate home databank hook-up that plugs you into the world around you.

STAR TREK—THE MOTION PICTURE

After a decade in media limbo, *Star Trek* is blasting off for deep space adventure once again. This December, a \$30 million widescreen epic, *Star Trek—The Motion Picture* will wing its way to theaters across the country, reuniting the original show's cast and crew. As exciting as the story on the screen may be, the behind-the-scenes scenario involving the re-making of *Star Trek* is even more intriguing. Next issue, *FUTURE LIFE* talks to Robert Wise, Gene Roddenberry and the movie's cast in an attempt to chronicle the trials, tribulations and triumphs involved in relaunching the *Enterprise*.

ELECTRONIC FUN

Today's electronic games are something more than mere toys and tomorrow's items promise to be even more exciting. Writer Stephen Sansweet spotlights the wizardry-laden realm of electronic gaming, introducing you to hand-held electronic sports games, button-controlled spaceships programmed for out-of-this-world warfare, cartridge video games, astrological computers, electronic detectives, phaser target practice ranges and verbose teaching robots. Sound spacey? It is.

THE BLACK HOLE

Walt Disney Studios takes the giant leap towards the stars this year with the release of their mind-boggling space opera, *The Black Hole*. Budgeted at nearly 20 million dollars and with astonishing special effects implementing the talents of Peter (20,000 Leagues Under The Sea) Ellenshaw and son Harrison (Star Wars) Ellenshaw, the film is an admitted gamble for the filmmakers. Will the public take it seriously? Will the film stand on its own merits? Or will the Disney logo cause it to be ignored? Producer Ron Miller and director Gary Nelson discuss taking the Disney team into space.

PLUS:

An exclusive interview with famed science fiction writer Theodore Sturgeon, who chats about what the future holds for social relationships. . . Author Robert Schekley ponders the future of consciousness: is it necessary for the survival of the species? . . . A special look forward to some of the greatest achievements and breakthroughs the 1980s may bring. . . Video Images updates new science and science fiction productions coming to television. . . The fantastic space art of Jon Lomberg, art supervisor for Carl Sagan's upcoming PBS series, *Cosmos*. . . plus book reviews, Alternate Space and Earth Control views, and Databank news.

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